STYLE ANOMALIES ON THE TORONTO STOCK EXCHANGE:

A UNIVARIATE, MULTIVARIATE, STYLE TIMING AND PORTFOLIO SORTING ANALYSIS

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Prepared under the supervision of Professor Paul van Rensburg and presented to the School of Management Studies in fulfilment of the requirements for the degree of

MASTER OF COMMERCE
(Special Field: Finance)

November 2007

Abstract

A growing body of empirical evidence has found inconsistencies in the Capital Asset-pricing Model (CAPM) of Sharpe (1964), Lintner (1965), and Black (1972) and Ross's (1976) Arbitrage Pricing Theory (APT). Numerous attempts to explore the validity of these theories of modern finance have led to the identification of various firm specific attributes that explain the cross-sectional variation of returns. These attributes have appropriately been termed 'style anomalies'.

This thesis investigates the existence and exploitability of style anomalies for the shares comprising the Toronto Stock Exchange (TSX) for the period 31 January 1989 to 31 July 2005. The investigation is divided into four areas of research.

First, a methodology similar to Fama and Macbeth (1973) is used to explore the cross-sectional relationships between some 904 firm-specific attributes and the unadjusted and risk adjusted monthly returns of equities constituting the S&P TSX Composite Index. A myriad of uncorrelated style anomalies are found to persist before and after controlling for systematic risk, and are categorized as either size, growth, momentum, value, liquidity and bankruptcy (risk) effects. The most significant attributes from each respective style group include: Price, eighteen month change in net tangible asset value, price change over twelve months, twelve month change in price to net tangible asset value, three month change in the absolute volume ratio and interest cover before tax. Multivariate testing confirms the ability of anomalies to explain excess returns. In and out sample cross sectional tests show inconsistent anomaly persistence, raising the question of whether they are perhaps perennial in nature.

Second, the predictability of style payoffs is examined through the analysis of autocorrelation and six style timing models. Strong positive autocorrelation at lower orders for the majority of style payoffs suggests that the ability to time payoffs is possible. The six month moving average timing model shows the best forecasting skill, followed by twelve month and eighteen month moving average models.

Third, the presence of firm specific attributes among three classified sectors namely: Basic materials, Cyclicals and Non-Cyclicals are compared. Risk, value and liquidity based anomalies dominate the Basic Materials shares. Liquidity effects stand out within the Cyclicals group, and the Non-Cyclicals sectors exhibit value and size effects. The ability to exploit all style-based anomalies after accounting for transaction costs is evaluated using a portfolio sorting methodology. The tests illustrate that increased exposure to the anomalies has delivered substantially higher returns with lower volatility than a buy and hold approach using an equally weighted all share benchmark. These abnormal returns are confirmed after adjusting for systematic risk. Further testing shows that the attributes, rather than loading on those attributes, are better at explaining share returns.

Finally, the seasonal nature of Canadian equity returns is investigated. A six month strategy of "Selling in June and going away till December" provides the most optimal returns. The calendar month tests find January, February and December to be the strongest months of the year. Attribute payoffs seem to show vague seasonal tendencies.

Declaration

I, Bryan Dunn, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other University. I empower the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

November 2007

Acknowledgements

The author would like to acknowledge the supervision and guidance of Professor Paul van Rensburg of the University of Cape Town.

The author also acknowledges the School of Management Studies at the University of Cape Town for permission to use the Finance Research Laboratory and its many resources for data collection and analysis.

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Introduction

"Investing in a market where people believe in efficiency, is like playing bridge with someone who has been told it doesn't do any good to look at the cards."

- Warren Buffett (1997: 164:166)

1.1. Introduction

The pursuit for greater wealth has always been amongst us. Since early forms of securitized instruments were introduced, participants have relentlessly sought methods of extrapolating better returns on investment. From the early debt markets of Ancient Greece that provided tradable "bottomry loans" for maritime shipments to the Bosphorus, to the credit markets of Rome that yielded interest rates of 4% at the apex of the empire, the concepts of reward for risk have been contemplated and put into practice.

This study is conducted with the same *ad modicum*: to explore the nature of the return generation structure assets and to inquire as to whether returns, outside of "modern financial pricing theory", are attainable.

The latter half of the 21st century saw the emergence of asset-pricing models that have somewhat universally been embraced as Modern Financial theory. The Capital Asset-pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965), and Black (1972) were developed around the concepts of asset risk and return from which a mean-variance efficient portfolio can be derived. The central theme of the CAPM lies with the ability of the market portfolio to explain the variation of share returns. Ross's (1976) Arbitrage Pricing Theory (APT) provides a less stringent model that allows for more than one factor to influence share returns. Equity return variation is therefore explainable using macroeconomic or other factors that are postulated to influence valuations and dividend streams. These models rely on sets of assumptions regarding investor rationality, market efficiency and the linear relationship between returns and proxies.

Since their inception, frequent attempts to evaluate their validity have found that factors outside of the CAPM and APT framework appear to be related to the share return structure. Evidence for firm specific variables that were able to generate returns in excess of conventional asset-pricing models began to surface. Some of the earliest US findings include: the small size effect (Banz (1981) and Reinganum (1981)); the price to earnings (P/E) effect (Basu (1977)); the dividend yield effect (Blume (1980)); and the market-to-book (M/B) effect (Stattman (1980)). The aptly named 'style anomalies' found in empirical studies have been posited to represent risk factors such as liquidity, neglect and greater risk amongst others. The case for style anomalies, however, does not invalidate traditional asset-pricing models due to their assumptions regarding market efficiency. Fama's (1991) joint hypothesis problem correctly points out that if assets appear to be mispriced, either the market is not efficient, or the model is incorrect, or some combination of the two exists.

Mounting academic evidence of anomaly persistence amongst both developed and developing markets continues to question the suitability of traditional financial theory, as well as open many doors to how assets should appropriately be priced. Furthermore, they have attracted the attention of financial practitioners looking to exploit these pockets of excess return or alpha. The range of different approaches to investing that allegedly produce greater returns is not new. Benjamin Graham, the mentor of the above quoted Warren Buffet, is regarded as the father of value investing. Other investing styles such as growth, momentum, quality, similarly focus their asset allocation towards different firm specific traits.

This thesis aims to identify whether style anomalies have persisted on the Toronto Stock Exchange. The procedure to investigate this topic includes exploratory analysis and the construction of the traditional asset-pricing models. Exhaustive quantities of firm specific attributes are then regressed on both unadjusted and risk adjusted cross sectional returns. The methodology basically follows that of van Rensburg and Robertson (2003) and also incorporates other techniques used to evaluate seasonality, portfolio trading strategies, and style timing. All data are sourced from DataStream International, which is free from the reputed look ahead bias. Given the limitations of obtaining data relating to existing companies, this study is not immune to the biases surrounding survivorship.

The remainder of this chapter is set out as follows: Section 1.2 discusses the contribution, and Section 1.3 outlines the structure of this thesis together with a brief overview of each chapter.

1.2. Contribution

This thesis contributes to the literature that investigates the robustness of traditional asset-pricing models, the presence of style anomalies, and the exploitability of such anomalies among Canadian equities. The categorization under which such empirical testing falls is best summarized by Fama's (1970;1991) study on market efficiency.

Fama (1970) divides his market efficiency tests under three headings: (1) Weak tests - that aim to understand how well previous returns explain future returns, (2) Semi-strong tests - that explore how quickly information is priced in, (3) Strong tests that investigate whether private information is reflected in share prices. Fama (1991) alters the three classifications somewhat. The first examines the predictability of returns, which include: asset-pricing, seasonality and style anomalies tests. The second scrutinizes price adjustments to public announcements. The third evaluates whether private information, not reflected in market prices, exists among investors.

The core focus of this thesis fits under the first classification as it seeks to enquire the existence of returns beyond those suggested by 'm*odern finance*'. This paper aims to take a more practical approach to the investigation of anomalies and looks to expand the knowledge set of the return generation process from which financial practitioners can benefit.

The investigation of anomalies requires the construction of asset-pricing models.

Traditional market models have received somewhat of a lukewarm reception among Canadian finance academics, as the empirical evidence does not award them much support. This study broadens the analysis of both the CAPM and APT models for Canada and evaluates their robustness and consistency.

As mentioned earlier, a considerable number of studies have dedicated their research to the new universe of attributes that are related with outperformance (anomalies). The literature regarding Canadian anomalies has been fairly limited to a handful of anomaly investigations, of which some are conducted over short time frames. This study extends the research of anomaly appearance by adding several hundred new attributes to those already explored. An exhaustive list of firm specific attributes, ratios and technical data is extracted and in many cases constructed to broaden the scope of the univariate cross sectional regressions.

The research into whether such strategies are exploitable after incurring the necessary transaction costs and risks, such as bid ask spreads, often receive less attention. The portfolio sorting methodologies employed are used to assess the borders of return generation from exposure to anomalies. This forms an important part of the study. Finally, other areas of focus are: style timing analysis and sector specific anomaly tests (both of which have not been explored in Canadian literature), multivariate analysis and seasonality among equities.

1.3. Thesis Organisation

Chapter Two provides a summary of the foundations of Modern Financial Theory and provides an understanding of the asset-pricing and valuation. The concept of the Efficient Market Hypothesis (EMH) are discussed along with the Dividend Discount Model (DDM), CAPM and APT models. Various insights and implications about these models by both financial practitioners, such as George Soros, and academics are presented. The concept of style anomalies is introduced and aims to clarify their origins, as well as their role in the theoretical framework.

Chapter three outlines the more prominent international evidence of style anomalies and the explanations provided for their presence. The evidence is compiled using van Rensburg's (2001) anomaly arguments classification that consists of: investor irrationality, investor rationality and methodical bias. The findings of empirical tests conducted on Canadian asset-pricing models are then presented. Thereafter, the literature review for Canadian style anomalies and seasonality follows. The review of empirical studies builds a platform to embark on exhaustive empirical tests on asset-pricing and style based anomalies.

Chapter Four discusses the nature of the data used throughout study. The share selection criteria is reviewed and is followed by discussions on the stock returns data firm specific attributes and data considerations. Procedures used for sorting and assembling data for further tests are discussed, and the descriptive statistics are presented.

Chapter Five opens with an exploratory analysis of the Canadian economy, share returns throughout the years and the different sectors comprising the Toronto Stock Exchange. Cluster and principal components are conducted to provide an understanding of the return generation structure and to extract the necessary proxies to construct asset-pricing models. Using two sets of indices, the methodology of van Rensburg and Slaney (1997) is applied to construct an APT model. An evaluation of models then takes place to assess which should be used to conduct risk adjustment in further chapters.

Chapter Six uses the methodology of Fama and Macbeth (1973) to conduct univariate cross sectional regressions for all the firm specific attributes. The analysis seeks to identify the anomalous attributes that are able to predict monthly stock returns before and after adjustments for systematic risk. The attributes are then examined for strength and consistency over the time series sample period. This Chapter provides the backbone of anomalies tests, on which further evaluation is conducted in later chapters.

Chapter Seven explores whether the monthly payoffs, derived from the Chapter Six, would have been predicted using autocorrelation and a variety of style-timing models. Consistency, accuracy and variability of the models' ability to forecast future payoffs are used to weigh up their predictive strength. The ability to time the payoffs to the style attributes would enable investors to improve the performance of a style-based strategy.

Chapter Eight investigates two aspects of style-based anomalies among Canadian equities. The first explores the presence of firm specific attributes among three classified sectors or industries. The second examines whether style-based anomalies can be exploited after accounting for transaction costs and risk adjustment. Portfolio sorts are also conducted to evaluate whether attributes, or their loadings, best explain share returns.

Chapter Nine undertakes to assess seasonality and persistence of calendar effects amongst Canadian equity data. The objective of this chapter is to conduct seasonality analysis for six month effects, calendar month effects and finally whether style anomalies exhibit seasonal tendencies.

Chapter Ten provides a summary of the results from Chapters Five to Nine. The final section concludes the thesis.

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Theoretical Overview

"...market efficiency per se is not testable. It must be tested jointly with some model of equilibrium, an asset-pricing model... As a result, when we find anomalous evidence on the behavior of returns, the way it should be split between market inefficiency or a bad model of market equilibrium, is ambiguous."

- Fama (1991: 1575-1576)

2.1. Introduction

Finance as a branch of economics aims to maximise utility in a world of scarce resources. Asset management similarly aims to maximise returns of assets, given the universe of market securities available. The predictability of assets returns has thus become a critical area of investigation by academics and practitioners alike. Academics seek to understand the relationships between economic or firm specific variables, risk, and returns, while practitioners aim to maximise these returns on behalf of clients.

Extensive research has been documented on the return generating process and the valuation of assets. This research has given rise to a number of theories that aim to explain the behaviour of assets returns. The most dominant theory in modern finance is market efficiency. The efficient market framework is built on the grounds of asset valuations reflecting available information to the market. Amongst the most cited studies that have been devoted to the market efficiency hypothesis is that of Fama (1970), who outlines three levels of market efficiency. These levels have become the formalized approach for categorizing the extent to which information is priced in securities.

While market efficiency remains part of traditional theory, much research has uncovered the existence of 'market anomalies' within the efficient market framework. The very existence of the active asset management approach rests on the belief that asset valuations are not necessarily correct and excess returns can be achieved by exploiting these deviations from fundamental value.

Testing whether such deviations exist requires the use of an asset-pricing model. If the deviation from fundamental value exists, it is based on the assumption that the model is correct. Asset-pricing models however are designed using market data and historical valuations. It can therefore be argued that models designed on imperfect data, are by construction, inherently flawed. Discrepancies in asset-pricing models' values and market values imply that either the market is incorrect in valuing the security, or the asset-pricing model is incorrect, or a combination of both exists.

The opening quotation drawn from Fama's (1991) renowned study, effectively outlines that examinations of market efficiency cannot in fact be separated from the tests of asset-pricing models themselves.

This chapter provides the overview of market efficiency and asset-pricing theories that underlie the empirical tests for anomaly existence in later chapters. The chapter is set out as follows: Section 2.2 provides a detailed look at the Market Efficiency Hypothesis, Section 2.3 introduces Asset-pricing theory and the CAPM, Section 2.4 provides an overview of the Arbitrage pricing Theory model, Section 2.5 introduces Style based anomalies and finally Section 2.7 summarises and concludes.

2.2. The Efficient Market Hypothesis

The efficient market hypothesis refers to the notion that all available information is reflected in the prices of the securities available. Bachelier (1900) originally suggested that *"past, present and even discounted future events are reflected in market price"* in support of market efficiency. The concept of market efficiency and the extent to which publicly available information is included in price, has been broadened since Bachelier's time.

Grossman and Stiglitz (1980) argue that investors will have the incentive to spend their time and resources finding information only if it is likely to result in generating excess return. This suggests that the investors attempt to assess the benefit of the information gathering against the cost of obtaining it. Prices would therefore only reflect information to a degree where the gains from participating are matched by the cost of research and transacting.

The random walk theory of share prices implies that successive returns are serially independent, implying that the last share price is the best prediction of the next period's share prices. The theory assumes that expectations of investors are unbiased and rational. The random walk theory also implies that each price change is based on new information provided to market participants. This information is equally likely to be positive or negative and enters the market in a random fashion. This thesis bares its opposition to the random walk theory upon the observation of asset value trends. If most stock markets have persistently trended up throughout history and traded assets have gained value, the probability of positive news (or its magnitude) is likely to have proved greater than negative news. The same trends appear to apply in all bull and bear markets for stocks, bonds, commodities and property. The random walk theory, however, is beyond the scope of this thesis.

Fama (1970; 1991) postulates three forms of this market efficiency: weak form, semi-strong form and strong form. The weak form of the efficient market hypothesis postulates that prices reflect all information that can be derived by examining historical data. The semi-strong form asserts that prices reflect all publicly available information regarding the firm's future prospects. Finally, the strong form of market efficiency declares that prices reflect all public and private information, including that of insiders of companies that are believed to possess superior information.

A critical input to the market efficiency question and valuations is how asset values are calculated. Asset values are determined by discounting future cash flows at an appropriate rate. The Dividend discount model, as proposed by Gordon and Shapiro (1956), states that a share's current price is the present value of all future dividends paid out to the owners of the security. The price of the share (or any income bearing instrument in this case) is thus:

$$P_{i0} = \frac{E(D_1)}{k_i - g_i}$$

where:

P_{i0} = *price of security i at time 0*

$E(D_1)$ = *expected dividend at time 1* = D_{i0} $(1+g_i)$

k_i = *the appropriate discount rate of asset i* = $E(R_{it})$

g_i = *the expected growth rate of dividends of asset i assuming* g_i < k_i

Asset values should thus only fluctuate when the value of the next dividend, the discount rate or the growth rate are likely to change. If the dividend discount model holds, daily fluctuations of asset values are unlikely to vary unless new information regarding these variables is brought to the market. Schiller (1981) suggested that if a stock price is an estimated value of the discounted dividends, then market prices are too volatile in relation to the dividend expectations. Schiller's finding seems to suggest that daily price movements usually do not rationally depict long term valuations.

Rational expectation theory holds that financial markets tend towards an equilibrium that accurately reflects the participant's expectations. Rationality implies that participants will act in their best interests, or in the case of investing, maximize profits whilst limiting risk. George Soros (2003:35) points out that participants act not on the basis of their best interests, but on their perception of their best interests. The two, according to Soros, cannot be identical as the participants' understanding of the world is unlikely to correspond to the underlying facts. For these reasons, financial markets on the balance are inherently unstable and underlying biases in the form of trends are likely to persist. The markets' inherent instability can be displayed by bust and boom situations that occur periodically. He further proposes a theory of reflexivity that aims to explain the reasons for bust and boom (or bear and bull) phenomena. Soros suggests that markets are not efficient due to the 'participant perception' problem. He notes that the more people believe market efficiency exists, the less efficient markets are likely to become.

Aside from the "participant perception" problem, Soros (1994:1) expounds on how market valuations can in fact affect fundamentals. He states, "The generally accepted theory is that financial markets tend towards equilibrium, and on the whole, discount the future correctly. I operate using a different theory, according to which financial markets cannot possibly discount the future correctly because they do not merely discount the future; they help to shape it. In certain circumstances, financial markets can affect the so-called fundamentals which they are supposed to reflect. When that happens, markets enter into a state of dynamic disequilibrium and behave quite differently from what would be considered normal by the theory of efficient markets. Such boom/bust sequences do not arise very often, but when they do, they can be very disruptive, exactly because they affect the fundamentals of the economy."

Soros (2003:43) also sheds light on a variety of concepts used frequently in financial markets, which relate to market efficiency. One of these concepts is expectations and the role they play in what has come to be known as market equilibrium. Market efficiency concerns itself with the extent to which information is reflected in asset values. Market participants interpret information and develop expectations to which they accordingly make decisions. The future they are anticipating, however, is directly dependent on their decisions today. The decisions do not relate to something independently given. If participants believe that the price of gold for instance will rise to a certain level, it in essence means that the collective of market participants believe that the 'collective of market participants' will purchase sufficient gold to bring the price to that level. The movement of price itself, the perception of that movement, and the perception of other market participants can create '*reflexive*' or self-affecting mechanisms. Ex Federal Chairman Alan Greenspan's warning of '*irrational exuberance*' which invoked a fall in asset values in 1994 is stated as an example of such a self-affecting occurrence.

If the possibility of "reflexivity" is adopted, it introduces uncertainty into asset-pricing techniques and casts doubt over the validity of asset values reflecting available information. Concepts pertaining to market efficiency or asset price equlibria, therefore, appear to be unresolved.

2.3. Asset-pricing and the CAPM

A fundamental tenet of Economics is to maximise the use of scarce resources. Similarly, modern financial theory aims to maximise returns within a universe of available assets. The return maximisation process for any asset requires weighing up returns against the risk.

Markowitz (1952; 1959) laid the foundation for modern portfolio theory with his proposition for the risk reward relationship. The theory assumes that rational investors who are wealth maximisers optimize returns for risk incurred. The risk of an asset is considered to be the variance of the returns dispersed around a mean return.

Markowitz went on to show that by diversifying into non-correlated assets, the risk of a portfolio could be reduced and the return maximised. This process results in the creation of mean-variance efficiency. Portfolios of assets are considered to be mean-variance efficient if they offer the highest expected return given the level of risk. Once all possible combinations of the assets are mapped out, an efficient frontier is formed. The frontier starts with a minimum variance portfolio, which represents the combination of assets that allows the least amount of risk. Investors can move further up along the frontier to seek greater returns, although higher returns come at the expense of greater risk. The efficient frontier provides the rational investor with a set of choices with respect to risky assets portfolios. This allows investors to select assets based on their level of risk aversion.

Sharpe (1964), Lintner (1965) and Black (1972) built on Markowitz's (1952) model to develop the capital asset-pricing model (CAPM). This entails the use of a single-index or market model where the return on each individual security is related to the return on the market index. The assumptions of the model include: (1) Investors are rational and are expected to diversify; (2) they are "Markowitz" efficient investors and intend to purchase along the efficient frontier; (3) they can borrow and lend at the nominal risk-free rate of return; (4) they have homogenous expectations; (5) they do not incur capital gains or dividend income taxes or transaction costs relating to buying or selling assets; (6) they hold the same one-period time investment horizon; and (7) all investments are infinitely divisible. Finally, the model also assumes non-existent inflation or change in interest rates (or both are fully anticipated), and that capital markets are in equilibrium.

Essentially, the CAPM derives beta as the only priced risk factor. Or to use the words of Fama and French (2002), "*The central prediction of the model is that the market portfolio of invested wealth is mean-variance efficient in the sense of Markowitz (1959). The efficiency of the market portfolio implies that (a) expected returns on securities are a positive linear function of their market β's (the slope in the regression of a security's return on the market's return) and (b) market β's suffice to describe the cross-section of expected returns.*" All non-systematic (asset specific) risk is diversified away by investors, leaving the market risk factor as the only priced explanatory variable. The return generating process is represented by

$$E(r_i) = r_{f,t} + \beta_i (r_{m,t} - r_{f,t})$$

The asset's expected return is represented by $E(r_i)$, the risk-free rate is $r_{f,t}$, the market return is $r_{m,t}$. The β_i coefficient reflects the sensitivity of the security to the market portfolio's risk adjusted returns. This coefficient is calculated as follows:

$$\beta_i = \frac{Cov_{i,m}}{\sigma_m^2}$$

The presence of the β_i coefficient has important implications. The β, or the slope of the regression of the security's return to the market return is the only measure of risk necessary to explain return. The relationship between the security returns and market returns is therefore assumed to be linear.

The beta coefficient of securities allows for the development of a security market line (SML), which represents the relationship between expected returns of all market securities to their betas. All tradable shares' expected returns can thus be derived by their beta values and the risk-free rate. In equilibrium, all assets and portfolios should fall on the SML. There is a positive expected premium for β risk and the expected returns for securities can be derived from past data. The amount of historical data to determine beta coefficients and expected returns is subjective in the hands of the researcher.

While the CAPM provides an expected returns model, a risk adjusted regression will result in the creation of the alpha variable and residual or error term. This single-index model can be represented as follows

$$(r_i - r_{f,t}) = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_i \qquad (2.7)$$

The CAPM suggests the α_i will be zero for all correctly valued securities. The ε_i term represents the error term of the equation.

2.3.1. CAPM and the market portfolio

The CAPM model requires the presence of a market portfolio and a risk-free rate in order to derive expected returns. The risk-free rate is often deemed to be the short term interest rate on government debt such as three month T bills. The market portfolio, as defined by the assumptions of the CAPM, should include all available assets investors can choose from. These would include bonds, listed and unlisted equities, property, commodities and exotic investments. Roll (1977) argues that unless the composition of the market portfolio is known with certainty, the CAPM cannot be tested. A market portfolio, including the myriad of investment options would be extremely difficult to put together. Roll, amongst others, resultantly concluded that the beta relationship suggested by CAPM is likely to be insignificant. The strict assumptions required by the CAPM model have further led to the development of less rigorous asset-pricing theories such as the Arbitrage pricing theory (APT). This model is explored in further detail in Section 2.3

2.3.2. CAPM and country specific factors

Stulz and Lang (1994) and Stulz and Karolyi (2002) shows that the CAPM model fails to capture various risks in different countries for two reasons. Firstly, they argue that an expected returns derived from the CAPM is a function of the past. The authors note that this is unlikely due to changing consumer trends, technology and demographics. Secondly, they postulate that not all investors face the same opportunity set.

Stulz and Lang (1994) suggest that the linear expected returns CAPM model does not account for increases in commodity prices and inflation, which are stochastic in nature. Furthermore, CAPM generally assumes the tastes of consumers to be the same. While this may be a plausible generalisation in the case of a single country, it is unlikely to be the case amongst different countries across the globe. Tastes and trends in consumer behaviour can also vary significantly over time. Real returns for a tradable asset may thus depend on the type of 'investor's perspective taken' as the past risk reward relationships may have no bearing on the future.

Capital asset-pricing models assume all investors have the same opportunty sets. Transactions costs, taxes and restrictions to buying various securities differ across national income groups in their respective countries. This means that the distribution of feasible returns differs among investors and asset-pricing models cannot represent a 'generalised' set of feasible returns.

The authors' criticism of the CAPM (and other asset-pricing models) are directed at their assumptions. More specifically, the existence of rational expectations based on the past and investor opportunity sets are brought into question.

2.3.3. CAPM in the perspective of social sciences

The CAPM asset-pricing model has somewhat been regarded as a foundation stone to modern financial theory. As a financial theory falls within the realm of social science and not a pure science, several considerations are deemed to be important.

Asset valuations in a traded market are determined through the demand and supply of these assets among active market participants. These participants base their decisions on their perception of the fundamental risk and reward characteristics of the asset.

George Soros (1998:8-40) states that there are two fundamental differences between social sciences and natural sciences. Firstly, people acting on their perception of reality and not the actual underlying reality produces interference with the predictability of human behaviour. Secondly, theories about human behaviour can influence human behaviour itself. Social sciences are heavily reliant on the presence of thinking participants and their resultant actions, which can help shape the perceived reality. This reliance upon thinking participants produces a constant state of disequilibria within the system under scope. Their perception of reality shapes their actions, which in turn shapes the underlying reality. This state of indeterminacy is comparable, but differs to indeterminacy found in pure sciences such as Heisenburg's uncertainty principle. In a natural science, however, theories on a phenomenone do not change the phenomenone itself. In social sciences, the observer's (market participant's) understanding of the underlying behavior of the system can affect the system. Facts can be influenced by statements made about the facts. So with asset-pricing, market prices (which empirical tests are seen as the 'facts'), can be influenced by statements made about the prices ('theories about the facts'). Soros goes on to say that if markets are believed to be efficient, they are likely to become less efficient, because as investors stop trying exploit mispricings, the number of mispricings are likely to widen.

Finally, Soros also suggests that economic theories are premised on assumptions and have conclusions that follow deductive logic. For instance, the CAPM assumes all investors have homogenous expectations. If the assumption is held to be false, the conclusions derived from the CAPM remain unable to be disproved, as the assumption is a necessary premise. The assumptions of the CAPM (and other asset-pricing models) also tend to be rigid and do not allow room for flexibility. The development APT model is partially a by-product of these mentioned complications.

2.4. The Arbitrage Pricing Theory (APT)

The APT, as proposed by Ross (1976), follows less rigorous assumptions than that of the CAPM. The APT assumes: (1) capital markets are perfectly competitive, (2) investors prefer more wealth to less wealth, and (3) the stochastic process generating asset returns can be represented as a linear K-factor model. The APT thus allows the inclusion of a multitude of common factors that collectively explain the return generating process. The linear model can be represented as follows:

$$R_{it} = E(R_{ft}) + \sum_{k=1}^{K} \beta_{ik} f_{kt} + \varepsilon_{it}$$

where,

R_{it} = realised returns earned by asset i in time period t, where i = 1… N and t = 1,2… T

$E(R_{ft})$ = expected rate of return of asset i for period t at the beginning of period t.

f_{kt} = the k^{th} risk factor that impacts on asset i's returns at time t, where k = 1,2… K.

β_{ik} = an OLS regression estimated coefficient that measures the sensitivity of R_{it} to movements in f_{kt}

ε_{it} = a normally distributed random error term t which measures the unexplained residual return of asset i in period t, where $E(\varepsilon_{it}) = 0$.

The systematic risk element (beta) is represented by the assets' sensitivity to the variation of the common risk factors. There are no limits to the number of risk factors or proxies included.

The APT, unlike the CAPM, does not require the presence of the market portfolio variable. The APT thus allows for the inclusion of common risk factors that would systematically affect the returns of the security. The nature of the variable does not have to be known either. Asset-pricing theory is built upon the grounds that an asset's value is determined by the present value of expected future cash flows. The common factors should thus include pervasive economic factors that are likely to affect the future cash flows. Chen, Roll and Ross (1986), whose work related largely to APT, contend that economic variables that affect cash flows and affect perceptions of market participants should be included as common factors. In this way, multifactor APT models are more flexible and would appear more accurate in capturing the multitude of attributes that determine share prices.

The choice of common factors to be included can be derived through the calculation of correlation matrices and covariances. Promax and Varimax factor analytic techniques are generally used to derive factors that explain common variation. Random common factors may arise from these methodologies that result in the inclusion of variables that are mere statistical constructs. McElroy and Burmeister (1988) argue this to be a major weakness in factor analysis. Fama (1991) states that "multifactor models offer at best vague predictions about the variables that are important in returns and expected returns", and further warns that the relationship between returns and economic variables can be spurious in nature as a result of data mining.

The APT model is presented as a statement about ex ante (expected) returns. When considering ex post returns the Multi-index model is used.

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{factor1,i}(r_{factor1,t} - r_{f,t}) + \beta_{factor2,i}(r_{factor2,t} - r_{f,t}) + \ldots$$
$$+\beta_{factorK,i}(r_{factorK,t} - r_{f,t}) + \varepsilon_{i,t}$$

The Asset-pricing Theory Model states that the expected value of α_i is zero for all securities employed. The value of α_i ex post should sum to zero using the Multi-index model for diversified sets of returns. The sample α_i values should also be serially independent.

2.5. Style based abnormal returns

Since the inception of asset-pricing models, much research has been devoted to out performance strategies that yield higher realised returns to those suggested by the asset-pricing models. This section looks to explore the origins and implications of the different techniques used to research such strategies.

Consistent outperformance by well-acclaimed market strategists has prompted studies by academics and practitioners alike. Attempts to empirically verify the source of outperformance revealed that a number of firm specific attributes appear to be historically responsible for returns in excess of those suggested by the asset-pricing models. These attributes were later termed 'financial anomalies' or 'anomalous variables'. Investment strategists aiming to exploit these relationships are deemed to adopt different investment styles based on the type of anomaly. Examples of such styles include: value, growth, liquidity, size and technical factors. The uncovering of such style based anomalies makes up the core of the research in this thesis. The terms 'financial anomalies', 'style based anomalies', 'style based attributes', 'anomalous attributes' and 'firm specific attributes' are used interchangeably for the remainder of this study.

Asset prices in the weak form of market efficiency, as postulated by Fama (1970), should reflect information that can be derived from historical trading data. Excess returns based on the past, without any foresight of the future, are by definition unattainable. The weak form of market efficiency thus implies that any attributes that may have resulted in outperformance do not have bearing on future returns, as they are already priced into the asset values. Findings of financial anomaly presence are therefore in contrast to the market efficiency hypothesis. A number of possible explanations follow.

Some attributes may be randomly construed as a result of continuous data dredging and mining. Extensive statistical tests on large data sets are inevitably likely to yield spurious attributes that present themselves as good predictors. One of the most infamous examples is that of David Leinweber[1], a member at CalTech's economics department. Whilst searching, through a UN CD ROM for variables that held the strongest relationship to the United States stock markets, he found that butter production in Bangladesh had the highest correlation with the S&P 500. Persistent research on outperforming variables increases the probability of statistical constructs. Some of these may be random and may not have any clear economic rationale.

Firm specific characteristics may serve as proxies for omitted risk variables. Basu (1983) and Roll (1977) contend that evidence against the CAPM and market efficiency may be caused by unrepresentative proxies. Studies such as Ball (1978) and more notably Fama and French (1992) suggest that anomalies may also represent risk factors (such as bankruptcy or size) unaccounted for in asset-pricing models.

Most data sets used for empirical research are subject to the survivorship bias. The survivorship bias means that only firms that remain listed are included in data testing. Firms that de-listed for reasons such as bankruptcy or merger acquisition activity are typically excluded. Excess returns generated in statistical tests may thus erode after inclusion of the de-listed firms.

Beta coefficient estimation for market or risk proxies in asset-pricing models may be inaccurate. The period used to measure beta is subjective to the practitioner, allowing for a natural variation in model results depending on the time frame used. Beta values should change over extensive time series of data as the firm moves through its lifecycle stages of initial high growth, maturity and decline. Sample periods adopted by researchers are therefore likely to influence model estimation and test results.

Transaction costs incurred to exploit anomalous attributes are also expected to reduce and possibly nullify excess returns. And finally, the market may simply not be efficient. A persuasive case against the efficient market hypothesis can however be made if observable anomalous attributes have persistently rendered abnormal returns and continue to do so.

[1] Sullivan, Timmermann and White (1998)

Other studies suggest that the anomalous nature of returns can be explained by investor's behavioural tendencies. Examples of such tendencies include: over-reaction to news and events, 'glamour stock' selection and 'safety with the herd' mentality. van Rensburg (2001) groups the explanations into three categories of arguments, (i) Methodological bias, (ii) Investor irrationality, and (iii) Investor rationality. These groupings provide a thorough framework of most of the anomalous literature and 'style based' research discussed in Chapter Three.

2.6. Summary and conclusion

This chapter provides a foundation of theory on which the empirical tests of this thesis are built. Extensive research on the return generation of assets have led to a number of theories of asset valuation and pricing. The Efficient Market Hypothesis (EMH), the Capital Asset-pricing Model (CAPM), Arbitrage Pricing model (APT), and the Dividend Discount Model (DDM) are the predominant theories and have since become part of the traditional understanding of how assets should be priced.

An efficient capital market can be defined as one in which security prices adjust rapidly to the arrival of new information resulting in securities that reflect all available information. (Reilly and Brown, 2000). The assessment of an efficient market requires the an asset-pricing model that can measure whether deviations between market and model values exist. Asset-pricing models, however, are constructed using market values, which brings the validity of the model into question. The 'joint-hypothesis' problem (Fama, 1991) asserts that market efficiency cannot be evaluated without testing the validity of the asset-pricing model.

The EMH, CAPM, APT and DDM are discussed in some detail. All models have experienced some degree of criticism by researchers, mostly as a result of their rigid assumptions. Other criticisms are drawn from the models' failure to consider the inherent flaws of market participants, and the ability of models to influence their own users which consequently influences their soundness.

Some firm specific attributes have shown to be remarkably persistent at explaining returns outside of asset-pricing models. These attributes are in contrast to both the efficient market hypothesis and asset-pricing models, as they have continued to persist despite being observable to market participants. This thesis aims to identify these 'anomalous' attributes among firms listed on the Toronto Stock Exchange and explore their behaviour over the sample period. Further tests are conducted in Chapters Six to Eight which seek to explore the anomalies' nature and determine whether abnormal returns have been attainable.

-3-

Literature Review

3.1. Overview of International evidence

"... (Anomalies) mean that the most interesting insights into the behaviour of stocks are being discovered by tedious and painstaking thorough examination of data. While it would be foolish to proclaim that 'theory is dead,' the anomalies signal that, at least in studies of equity markets, empiricism is currently the king."

- Reinganum (1984:839-840)

An abundance of international papers cite evidence of style anomaly pervasiveness among stock markets around the world. This section provides an overview of some of the more prominent findings, namely size and value effects.

Banz (1981) documents that excess returns would have been realised by holding small companies over the period, 1936 to 1977. Banz's analysis also reveals that size is almost as statistically significant as the beta coefficient in explaining share returns. A substantial part of the size effect is witnessed in January months. Reinganum (1981a; 1981b), Basu (1977) and Fama and French (1992) confirm the existence of size anomaly in the United States. Roll (1981a) and Reinganum (1970) showed that beta estimates are downward biased for small companies as a result of thin trading. The lower beta estimate causes lower predicted returns using the CAPM model than actual returns. Consequently, actual returns from these shares prove to be higher than expected returns derived from asset-pricing models. Christie and Hertzel (1981) propose that companies that become smaller in size have changed their economic characteristics, which infers that their risk categorization has changed. Small companies are envisaged to be riskier as they are less likely to withstand economic downturns. The beta estimate which is derived from their historical returns, when they were larger does not capture the new additional risk.

Chan, Chen and Hseih (1985), using portfolios based on size, find that the difference in return between the largest and smallest portfolios is 1.5% and 1.15% using the APT and CAPM model respectively. They conclude that the size effect's outperformance disappears when a better asset-pricing model (APT) is used. Chen and Chan (1991) suggest that small companies have lower production efficiency and higher leverage. They argue that size is a proxy for other fundamental risk.

Amihud and Mendelsohn (1991) find that small companies' stocks are less liquid and susceptible to thin trading. The lack of liquidity and comparatively higher transaction costs arguably result in most retail investors and analysts avoiding the stocks. The lack of investment interest in such shares and the lower prices assigned to them may explain their long run outperformance. They further suggest that the size effect is partly compensation for illiquidity. Roll, Blume and Stambaugh's (1983) reveal that the size effect's magnitude is cut in half if stocks are rebalanced annually. Their stance is in contrast to some authors who posit that this is the case if stocks are rebalanced daily.

Fama and French (1992) explore value effects by examining the price to book value (P/B) anomaly. Twelve portfolios are formed and ranked according to P/B for the years 1963 to 1990. The lowest portfolio had an average monthly return of 1.83% while the highest yielded on average only 0.3%. While on average the returns for low P/B portfolios are higher, there are periods in which the they significantly underperform. Chan, Hamao and Lakonishok (1991) find the presence of the market to book value (M/B) effect in Japan. Capaul, Rowley and Sharpe (1993) reveal that the market to book (inverse of P/B) effect is also present in a variety of developed countries.

The earnings yield (E/P) or inverse price earnings (P/E) ratio has received much attention in empirical studies. Benjamin Graham's[2] stock selection criteria suggested

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Oppenheimer and Schlarbaum (1981)

that the E/P ratio should be greater than twice the yield on AAA bonds. P/E ratios have been popular with value investors as they are can be used to compare company's values relative to their peers within the same industry or sector. Basu (1977) investigates the use of price to earnings ratios to forecast share returns. Studying shares over the 1956 to 1971 period, he observes that low P/E securities outperform high P/E shares by more than 7% per annum. He notes that the P/E anomaly persists after adjustment for the size effect. Reinganum (1981) finds that the E/P effect is highly correlated with the size affect. Fama and French (1989) argue that once size and M/B have been adjusted for, the P/E effect disappears. Damadoran (2004: 57-70) takes a sample of US stocks for the period 1951 to 2001 and segregates them into 10 portfolios according to P/E ratio each year. The lowest P/E portfolio achieved returns of 24.11% per annum while the highest P/E ratio scored 13.03% per annum.

3.2. Explanations for the style-based anomalies

van Rensburg (2001) categorizes the arguments for anomaly explanation into three groups, namely: (1) investor irrationality; (2) investor rationality; and (3) methodological bias. The same framework for discussing style based anomalies is followed.

3.2.1. Arguments for investor irrationality

De Bondt and Thaler (1985) explore the P/E effect and find that *loser* shares (performed poorly over a previous three to five year period) outperform the past winners in the next three to five years. Furthermore, it was found that the beta of the *loser* portfolio was lower than that of the *winner* portfolio and that the overreaction effect was not as a result of size. De Bondt and Thaler attribute this to overreaction by investors. Excessive pessimism brought about by a continuous string of poor results or market conditions can result in '*overselling*' or '*shaking out*'. Lakonishok, Shleifer, and Vishny (1994) echo similar findings for '*out-of-favour*' stocks.

Fama and French (1992) examine stock returns from 1941 to 1985 and find more negative serial correlation in five year returns than in one year returns with stronger negative serial correlation among small size stocks. This provides strong evidence that extended periods of positive returns are followed by negative returns and that mean reversion of returns is witnessed amongst most shares. Alexander (1964) finds positive serial correlation in European markets over short term periods, suggesting that if returns have been positive for six months, the next six months should also be positive. Grindblatt, Titman and Wermers (1995) note that mutual funds are more likely to buy winner stocks and dump losers. This behaviour inevitably helps generate price momentum. Their findings appear to reinforce the notion that investors and financial practitioners prefer 'safety within the herd' over short term periods. While temporary price momentum appears to exist and seems to be reinforced by investor behavior, the exact timing required to exploit the anomaly remains immeasurable and likely to vary.

Jagadesh and Titman (1993) find that price momentum does exist for winner and loser US stocks but timing is important. Using a sample period of 1941 to 1989, winner and loser portfolios are classified according to their return over the previous six months. Winners are found to be subject to positive earnings surprises while losers on the contrary experience negative surprises. Furthermore, positive momentum for winners continued for twelve months after portfolio formation and dropped thereafter. For the period 1941 to 1964, the loser portfolio begins to outperform the winner portfolio after 28 months. Again, for the period 1964 to 1989, losers start to outperform after 36 months. The study provides evidence of the mean reversion of returns among stocks.

George Soros's theory of reflexivity explains that within an up-trend's (bull market) early stages, the market usually anticipates a change in fundamentals before they surface and become available to the public. Once the awareness of the improved fundamentals increases, the action of market participants starts to support the trend's existence. The trend is likely to be tested on several occasions in its lifetime, and with every failure of breaking the trend becomes more strongly reinforced. Trend following traders become more conscious of price action. Strong price action supports their viewpoint and leads them to act on it by trading in favour of the trend's direction. Soros also suggests that the market participants may become more selective in their interpretation of the fundamentals regarding the trend. As price changes tend to psychologically affect the market participants' sentiment towards the underlying asset, trends can often be given a greater longevity than fundamental rationale would suggest. Soros' arguments provide a plausible explanation for share price momentum.

Lakonishock, Schleifer, and Vishny (1994) explore the merits of pursuing *glamour* stocks versus *value* stocks. Poor expectations of the firm's growth are usually associated with poor performance measures (ranked according to returns, cash flow, earnings and sales growth). Investors tend to rotate out of poor performing assets and into more attractive securities. This behavior leads to higher valuations for attractive securities, thus decreasing their expected returns. Shares that are overlooked are usually sold down and present better value prospects. Lakonishock et al agree with this proposition and observe that '*out of favour*' stocks, classified as *value,* are found to outperform *glamour* stocks. They also note that no evidence exists to attribute the value category's outperformance to higher risk. The risk measures include: consistency of returns, performance during bad periods, standard deviation of returns and beta. The findings suggest that investors are generally myopic with regards to their assessment of returns and pursue short term gains. *Winner* stocks therefore tend to overshoot while *loser* stocks are oversold. The earnings of the glamour stocks also tend to inevitably revert back to a more 'normalised' level. Lakonishock et al conclude, "Market participants appear to have consistently overestimated future growth rates of glamour stocks relative to value stocks

The irrationality paradigm can be extended to both individual investors and fund managers and institutions. Lakonishock, Schleifer, and Vishny (1994) suggest that fund managers would find it easier to justify their holdings of more popular stocks to both their clients and sponsors. Institutions are often ranked and judged on a short term basis by both media and clients. Financial intuitions' pursuit of short term gains in order to 'window dress' their portfolios can arguably result in short term momentum effects among stocks.

Crowd following or herd behaviour provides a possible explanation for anomalies. If investors do seem to 'feel safer in the herd' and prefer to invest according to the prevailing wisdom at the time, temporary overreactions cannot be ruled out. Key turning points in bull and bear markets are commonly known to be accompanied by excessive optimism or pessimism by both analysts and retail investors alike. This seems to suggest that market trends may be somewhat reinforced by herd behaviour and appear to breakdown when the majority have pushed prices beyond their fundamental rationale.

3.2.2. Arguments for investor rationality

The presence of anomalies may possibly be attributed to risk premia not captured by the asset-pricing model. Anomalous findings among securities are arguably proxies for other risks such as illiquidity, financial risk during economic downturns, small size or lack of sufficient operation's disclosure. The nature of these risks may not be accounted for accurately by the beta coefficients of asset-pricing models.

Fama and French (1992, 1993, 1995, 1996a, 1996b, 1998) propose that the so called anomaly presence is consistent with market efficiency. They argue that anomalies result from misspecified asset-pricing models that do not fully account for the entire risk profile of individual securities. Size and book-to-market ratios (B/M) can arguably be regarded as proxies for 'unobserved' risk factors. They propose that similar size companies are likely to be sensitive to macroeconomic factors such as interest rate changes and growth rates in the same way. Fama and French (1993) further construct a three-factor model that uses market return, size, and the M/B ratio as risk proxies. Lakonishok, Shleifer and Vishny (1994) note that risk based explanations that rely on an unspecified multifactor model have little ground for disproof, as the attribute that explains share returns may be proxy for some unobservable risk factor.

Ball (1978) argues that the anomalies existence contradicting the CAPM is likely to be caused by faults in the asset-pricing model rather than an inefficient market. Ball (1978) proposes that the P/E ratio absorbs risk factors left out of asset-pricing tests. The market consensus of a firm's overall risk profile is represented by the firm's P/E ratio. Higher risk requires higher expected returns, which translates into lower priced shares. Higher risk shares would therefore be characterised by lower P/E ratios.

Amihud and Mendelson (1986; 1991) find that thinly traded shares tend to outperform and earn higher risk adjusted returns. Their argument for higher returns is based on investors requiring a premium to hold less liquid assets that may also incur greater trading costs. Brennan and Subrahmanyan (1996) find a liquidity premium on low volume traded shares that persists after risk adjustment using the Fama and French (1992) three factor model. Brennan, Chordia and Subrahmanyan (1998) explore the liquidity premium after APT risk adjustment and confirm its presence. Roll (1981) suggests that the CAPM size anomaly is brought about by the downward biased beta resulting from serial autocorrelation in thin-traded shares. Thin traded shares tend to be most common among small companies. It appears that share liquidity may be jointly associated with the well documented size effect.

Arbel (1985) finds that securities that lack adequate information are likely to be considered riskier and therefore require higher returns to compensate investors. Using the coefficient of variation for analysts' earnings forecasts, he finds the correlation between the coefficient of variation and total returns to be statistically significant. Companies with a lack of consistent disclosures and corporate information may be shunned by market participants in light of the additional risk.

The investor rationality viewpoint offers arguments in favour of market participants investing on the basis of a logical risk reward paradigm. Furthermore, the arguments assert that asset-pricing models do not fully account for relevant risks not captured by the systematic beta coefficient. This bears similarity to the joint hypothesis problem of market efficiency where either the market is inefficient, or the model is misspecified, or a combination of both exists.

3.2.3. Arguments for methodological bias

The existence of anomalies may be purely random constructs or brought about by a number of methodological flaws incorporated in the testing process. This section reviews the literature discussing some of the different methodological biases and problems confronted.

The '*data snooping*' bias refers to the finding of variables that portray significant explanatory power, but have meaningless rationale, and are purely a result of pervasive research into data sets. Continuous dredging of data increases the probability of such spurious variables. Lo and MacKinlay (1990), Black (1993) MacKinlay, (1995) find that if these variables are used to construct asset-pricing models, and further used in empirical tests on the same database, the results should favour the model. This process is the same as back fitting a model onto a set of history that it sets out to explain. Undoubtedly, the results will appear to fit well.

There is a growing body of research assessing whether the same type of style based anomalies are recurrent among the world's financial markets. Haugen and Baker (1996) find P/E and M/B effects across five international financial markets. Fama and French (1998) and Rouwenhorst (1999) show that the common style attributes (size, value and momentum effects) that have been prevalent in developed countries are also present emerging countries. Serra (2003) finds that the most significant factors are widespread across some 21 emerging markets. She further reports that payoffs to these factors are not highly correlated. Anomalies therefore appear to persist, but vary in magnitude and consistency over time series data sets for different countries. The multitude of similar style effects across countries does however appear to refute the notion that these effects are mere statistical constructs.

Becker and Ochman, (2004) find that significant style factors may differ between markets for reasons such as differences in capital structure, accounting systems, reporting policies, and homogeneity of the universe and not for data snooping.

The '*look-ahead*' bias occurs when data used in research reflects information not yet available to market participants. Banz and Breen (1986) highlighted the problem by explaining that accounting values may be applied retrospectively to data sets. Period end results are in almost all cases released after the period end date. A price earnings ratio, for example, that is constructed using earnings results that have not been released, is flawed as it is assumed that investors know outcome before it occurs. Banz and Breen (1986), state that the implications are that investors have the ability "to forecast future reported earnings without error."

The '*survivorship bias*' arises when data sets used for research are incomplete as they only contain the securities that remain listed at the end of the sample period. Banz and Breen (1986), using bias free data, find a significant size effect and insignificant P/E effect. The 'unbiased' data set yields both significant size and P/E effects. Similarly, Davis (1994) finds that earnings yield, book to market, and cash flow to price effects occur in data samples void of the survivorship bias. Davis postulates that such relationships have been present for at least the past half century and are not a result of data snooping or survivorship bias. Kothari, Shanken and Sloan (1995) use data from the S&P bias free analyst's handbook, and note that the book to market effect is found to be somewhat weaker than the biased data.

Berk (1995) argues that the size effect anomaly can be explained by the fact that riskier firms will have lower market values and thus by construction have higher expected returns. Berk (1995) concludes that if market value is used as the measure of size, it will predict return.

3.3. Evidence on Canadian CAPM and APT models

3.3.1. The CAP M model

Morin (1980) applies the CAPM framework to Canadian and US data, but does not succeed in explaining returns, mainly because of measurement problems of data limitations. He notes that Canadian beta premiums are positive among equities, but are less so than their U.S. counterparts.

Robinson (1993b) replicates the U.S. empirical studies conducted by Blume (1971) with Canadian data, and found less support for the validity of the CAPM in Canada than in the U.S. Using monthly compounded returns, he performs correlations tests of beta stability over time periods for US and the more thinly traded Canadian share samples. He finds that the inter-temporal beta correlations are lower among Canadian shares. The results are unexpected as empirical evidence on thinly traded shares (Dimson and Marsh (1983)) suggests that thinly traded shares should have greater inter-temporal beta stability. A comparison of R squares, using the CAPM, shows that the Canadian model holds less explanatory power than the US CAPM. The findings are consistent with earlier literature with the market premium found to be indistinguishable from zero and in many cases negative.

Calvet and Lefoll (1980) reach a similar conclusion and hypothesize that the effects of seasonality (patterns such as the January effect) and the failure to account for the firm size effect on returns, are responsible for the CAPM's lack of success in explaining returns. The early Canadian CAPM studies portray the model as one that is unable to describe market returns accurately.

A possible reason for the poor performance of the CAPM with Canadian data is the greater incidence of thin trading in Canada compared to US samples (Fowler, Rorke, and Jog (1980)). Thinly traded stocks create statistical problems for measuring the difference between returns on the thinly traded stocks, and returns on the market index. This results in a weakening of statistical inferences from such tests. Fowler et al also demonstrate that estimates of Beta are downward biased and inconsistent when thin trading is present. Heteroscedasticity is found to be evident on the Toronto Stock Exchange (TSX), but can be reduced by the use of a logarithmic form of the CAPM model and also by reducing the number of thinly traded stocks in the sample.

Bodie, Kane, Marcus, Perrakis, and Ryan (1993: 361) also conclude that previous attempts by Calvet and Lefoll (1980) and Morin (1980), among others, to explain the expected returns of Canadian equities in a static framework, where the CAPM was not even tested with size-sorted portfolios, had generally failed.

3.3.2. The APT Model

The arbitrage pricing theory (APT) model is similar to, but less restrictive than (because of its underlying assumptions), the CAPM. Two approaches can be used to test market efficiency using the APT. In the first approach, the data are sorted by statistical similarity (common factors), and the factors are tested to determine whether they help explain share returns. The second approach considers a number of macroeconomic factors (such as changes in GNP and interest rates) and examines whether and how they affect stock returns. Hughes (1984), Abeysekera and Mahajan (1987), and Smith (1993) find only weak support for the APT in Canada using the first procedure. Otuteye (1991) finds somewhat stronger empirical support for models working with the macroeconomic factors. The conflicting findings of Abeysekara and Mahasan (1987) and Hughes (1984), suggest that it is doubtful that a static (unconditional) APT can explain the expected returns of Canadian equities.

Smith (1993) finds that the APT model provides little improvement to the market model. The most significant sector with explanatory power is gold mining. Most of the factor premiums are not significantly different from zero. Using monthly data, Abeysekera and Mahajan (1987) test the validity of the IAPT (International APT) model. Their tests do not find support for the model, showing similar conclusions to domestic APT studies.

Kryzanoski and To (1983) use factor analysis to identify factors responsible for explaining US and Canadian share returns variation from 1962 to 1971. In the Canadian sample, they find that the first factor has comparatively worse explanatory power. They also note that up to 18 factors are found to be significant. The Scree plots implemented do however suggest a two factor approach captures the bulk of common variation. This leads the authors to agree with the US study by Roll and Ross (1980) that two factors emerge to sufficiently explain share returns.

Koutoulas and Kryzanoski (1994) test which macroeconomic factors present the most concise explanation of Toronto Stock exchange share returns. Lagged industrial production and international components of differential between US and Canadian economic lead indicators are shown to influence Canadian returns. Otuteye (1989) explores whether the same economic variables apply to both Canadian and American share returns. The variables found to bear explanation include: industrial production, the iern structure, risk premium, inflation and the market portfolio. He concludes that the same factors can be used for both countries.

Schmitz (1996) conducts a number of Canadian APT tests by regressing 38 years of quarterly macroeconomic factors on the market premium. He finds that the dividend yield, default spread, term spread, risk-free rate and industrial production growth rates explain 10% of the market premium's variation. Using annual data, the results improve to 41%. The dividend yield is the best explanatory variable while the term spread shows the greatest prediction power.

Freund and Larrain (1997) employ techniques that detect the presence of random and non-random behaviour in a time series for stocks on the Toronto Stock Exchange (TSX). They find that monthly returns of various stock indexes were more closely described by a random walk process while significant departures from a random walk model were found for a minority of individual stocks.

3.4. Canadian style anomalies

Momentum effects

Kryzanowski and Zhang (1992) investigate the overreaction hypothesis for Canadian stocks over the period 1950-1988. Using the same approach as De Bondt and Thaler (1985), they find significant continuation of winner and loser portfolios for one and two year periods. Unlike De Bondt and Thaler, they fail to find reversals within the winner and loser portfolios for up to ten years. The authors conclude that the overreaction findings in the US are not applicable to Canada and are more likely to reflect stock price momentum

Assoé and Sy (2004) assess the rewards of following a contrarian strategy of buying previous *loser* and selling *winner* stocks on a monthly basis from 1963 -1998. Using a portfolio sorting methodology, he obtains results similar to Jegadeesh's (1990) U.S. study. The *loser* portfolio significantly outperforms the *winner* portfolio. After adjustments for transaction costs, the strategy is only economically profitable for small firms. The January effect also appears to be accentuated for the loser portfolio shares. Liquidity constraints and bid ask spread costs are not accounted for in the study.

Foerster, Prihar and Schmitz (1994) attempt to identify portfolios of TSX-100 stocks that exhibit price momentum. Using two portfolios based on the best performers and the worst performers adjusted quarterly, they observe that the best performers do tend to continue outperforming the TSE-100 index. This is confirmed after adjustments are made for transaction costs. The best performing portfolio still produced superior performance when risk was controlled for by using Sharpe and Treynor measures.

Cleary and Inglis (1998) investigate the profitability of momentum based strategies on the Toronto stock exchange from 1978 to 1990. Portfolios of shares are created based on the past four quarter's momentum ranking with more weighting on the most recent quarter. He finds that the top performing momentum portfolio continues to outperform lower portfolios over the sample period. The top portfolio returns have greater Sharpe and Treynor ratios than both the Market and lower momentum portfolios. He finds a portion of profitability represents appropriate compensation for risk and risk premiums that seem to vary through time. This strategy may not be exploitable by the retail investor due to the higher fraction of transactions costs likely to be incurred. He concludes that abnormal returns are arguably attainable by nimble traders with lower costs.

Size effects

Foerster and Porter (1992) examine the size effect among dual class shares after adjusting for market wide and trading related risks. Market wide and trading related risks are adjusted by choosing shares with the same dividend characteristics and liquidation risk and forming portfolios. The 'superior voting rights' shares are found to have lower market values compared to the higher market capitalisation 'restricted voting rights' shares. Small cap and large cap portfolios of stocks are formed for the test. Before adjustments for risk, a size effect is documented between the different classes of shares. After the adjustments are made, they find that the size effect is less significant.

Athanassakos (2002) explores the nature of the alleged January effect and whether Canadian shares participate in this well documented seasonal phenomenon. He finds that risky securities with high betas and low bond rating have a more pronounced January effect. Excess returns for the remainder of the year however, tend to be lower. Size is not considered to be an important determinant of the January effect. Athanassakos postulates that excess returns generated in January by small firm are more likely to be a result of firm specific risk and possibly illiquidity.

Fowler, Rorke and Jog (1980) and Jog and Riding (1986) confirm that Canadian markets may suffer from thin or sporadic trading. Elfakhani and Bishara (1991) find evidence supporting the inverse relationship between risk-adjusted excess returns and firm size. They also find little support for an independent P/E effect and suggest that P/E often acts as a proxy for the size anomaly. Elfakhani (1993) observes that the size effect is significant after CAPM risk adjustment. Elfakhani, Lockwood and Zaher (1998) conduct tests for the size effect over a four year period from 1986 to 1990. They find a small size effect that is consistent during all months of the year and not just January.

Value effects

Bourgeois and Lussier (1994) examined the P/E effect for the period 1972 to 1988 by forming six portfolios of stocks ranked according to their P/E ratio. The lowest P/E portfolio generated higher returns than the TSE-300 while the highest P/E portfolio and the negative P/E portfolio yielded lower returns. The results are confirmed after risk adjustment. Furthermore, monthly excess returns of the portfolios are regressed against the market premium. The beta coefficients of the lower P/E portfolios are found to be significantly lower than those of the high and negative P/E portfolios. The P/E anomaly, however, proves to reverse as high P/E stocks outperformed low P/E stocks over the sample period 1977-1988.

Bartholdy (1998) observes that P/E ratios are able to predict future returns of Canadian shares. He finds that low P/E strategies produce higher returns and attributes this phenomenone to investor overreaction, especially with regards to earnings information. His tests show that abnormal returns can be generated by selecting the lowest P/E shares which have suffered the greatest reduction in P/E ratio change. The results are contrary to those of Kryzanowski and Zhang (1992).

Filbeck and Visscher (2003) explore dividend yield strategies for stocks among the TSE 30 for the period 1987-1997. They select the 10 highest dividend yield stocks and rebalance yearly. Risk ratios such as Sharpe and Treynor measures are employed to evaluate results. The findings reveal that the high dividend paying stocks outperform the TSX 30 as well as the TSX 300 index with better risk ratios in both cases.

Elfakhani, Lockwood and Zaher (1998) document a positive and slightly significant relationship between returns and book to market ratios over the 1975 to 1989 period. High book to market firms outperform low book-to-market firms after controlling for size effects amongst securities. The book to market effect, however, appears confined to the period between 1984 and 1989, a period corresponding to lower capital gains taxes in Canada.

Combinations of effects

An international study on 18 separate countries conducted by Arshanapalli, Doukas, Coggin and Shea (1998) reports a significant size and M/B effect in Canada. This is further confirmed by Bauman, Conover and Miller (1998). L'Her, Masmoudi and Suret (2002) using independent sorts, followed by an orthogonalization, examine the size, M/B, momentum anomalies as well as returns explained by the market premium. Portfolios were formed using the same methodology as Fama and French (1993) for Canadian stocks over the period 1960 to 2001. The average annual premiums are 4.52%, 5.08%, 5.09% and 16.07% for market premium, size, M/B and momentum respectively. Furthermore, M/B effect is found to be more positive in down markets than up. The momentum effect is greater in up markets than down. In expansive monetary periods, the size and M/B and momentum effect is significantly positive while the momentum effect is only slightly positive during a monetary contraction period.

Susmaga, Michalowski and Slowinski (1997) explore attributes that appear to have the most explanatory power of abnormal returns from 1989 to 1993. Using a portfolio tilting methodology they find attributes of stocks that commonly have abnormal returns. The following attributes occur most frequently: relative earnings in past eight quarters, price momentum rank, unexpected quarterly earnings over the same quarter last year, price to book ratio, price to sales ratio, market capitalization, and change in quarterly earnings momentum.

Kortas, L'her, and Plante (2004) examine the relation between future returns and four firm characteristics: the book-to-market ratio; the forward earnings-to-price ratio; price momentum; and analyst's earnings revisions; made over the 1988 to 2001 period. Using the Fama-Macbeth two-step procedure, they find that the four variables help predict future returns of Canadian equities. The profitability of a long position in the stocks with the highest expected returns and short stocks with the lowest expected return, over different forecast horizons (one, three, and six months), is calculated. The best portfolio (three month) provides an average 2.53% monthly raw return and a 2.51% risk-adjusted return over 1993-2001.

Jog and Li (1995) explore whether risk adjusted returns are inversely related to a number of price related variables. The variables include stock price level (P), size (MC), price to sales ratio (P/S), P/E ratio, price to cash flow (PCR), price to post tax operating profits ratio (POER), price to book ratio (PBR) and price to debt (PR). The methodology employed considers the possibility of industry bias and is adjusted for using only 'industry standardized price related variables'. They find that the variables P, PER, PCR and POER exhibit the ability to generate abnormal risk adjusted returns.

3.5. Canadian seasonality in share returns

The old adage "Sell in May and go away" or the "Halloween effect was coined in the early 20th century by stockbrokers who noticed that the northern hemisphere's summer period is generally weak for the stock market. Traditional wisdom suggests that shares should be bought in early November and held to the end of April. During the May to October six month period, investors should remain in cash.

Bouman and Jacobsen (2002) explore the persistence of the "Sell in May" effect among 37 global exchanges. They examine whether the returns during the May to October period are significantly different from zero. Strategies aiming to exploit the seasonal tendency are tested over most available exchange data for all 37 countries. They find that the "Sell in May" effect persists in 36 of the 37 countries and report highly significant results for European countries. The longest set of seasonal evidence can be traced to early UK share returns since 1694. Canadian shares are found to be prone to the same six month seasonal pattern with summer returns significantly different from those during winter. Furthermore, application of the six month seasonal strategy would have provided higher returns with less volatility than a buy and hold strategy of the market index.

Athanassakos (2005) explores the persistence of seasonality on Canadian listed companies as well as government securities. His findings support Bouman and Jacobsen (2002) and the "sell in May" seasonal strategy. He reports that small companies commanded high excess returns during winter months and less so during the winter. This seasonal strategy has outperformed a regular buy and hold strategy significantly over the last 47 years. An average annual return of 20% was achieved by being long equities only during November to April and long treasury bills during May to October for the 47 year period. The strongest months in the year on average are found to be November, December and January, with the weakest being September and October.

Tinic, Barone Adesi and West (1987) examine the January effect among companies with low marker capitalizations. They find the calendar month to exhibit a significant size effect especially with thinly traded stocks. They partially attribute the January effect to the imposition of capital gains taxes and international listings which are subject to the January anomaly in their foreign market.

3.6. Summary and conclusion

A considerable amount of empirical testing finds the existence of anomalous effects among global exchanges, with the most frequently cited studies having been conducted on United States equities. The sheer magnitude of evidence favouring these effects has emerged as traditional asset-pricing models appear unable to provide explanation for the abnormal returns generated.

Several attempts to explain style anomaly prevalence have yielded mixed results and brought about conflicting arguments. The various propositions for anomaly existence include investor irrationality and inefficiency of markets to price assets correctly. Statistical biases and methodology limitations are also pointed out to be potential sources.

This chapter introduces the anomaly concept by reporting some of the earlier US studies that provided a framework for further research among other countries. The most common anomalous attributes are first discussed and further elaborated using van Rensburg's (2001) anomaly arguments classification that consists of: investor irrationality, investor rationality and methodical bias. Empirical evidence of asset-pricing models and financial anomalies throughout Canada is further presented.

The literature reveals conflicting results for Canadian Asset-pricing models. Early studies surmise that traditional asset-pricing models such as the CAPM and APT appear inaccurate at explaining share returns. Later studies show that the APT model offers a moderately better alternative to the CAPM. Similar to other international studies, the Canadian equities market exhibits anomalies that have delivered abnormal returns. The most notable attributes include: price, price earnings ratio, market to book ratio (as well as book to market ratio), price momentum, dividend yield, price to sales ratio and market value. The literature is divided over the consistency of the attributes over different sample periods. Within the spectrum of the market efficiency problem, sufficient evidence for seasonality is reported. The six monthly "Sell in May and go away till November" effect, derived from the market trading adage, is also documented.

The evidence provides a concrete case for financial anomaly pervasiveness throughout the available data on Canadian equities, but fails to provide convincing rationale for their presence. While traditional asset-pricing theory has not been able to provide satisfactory explanations, they cannot be refuted, due to the joint hypothesis problem and the assumptions from which the models built. The literature discussed in this chapter does however build a platform to embark on exhaustive empirical tests on asset-pricing and style based anomalies.

-4-

Data and Descriptive Statistics

4.1. Introduction

This chapter provides an overview of the data to be used and analyzed in Chapters Five to Nine. The overview consists of three parts, namely: (1) To discuss the size and quality of the data in detail, (2) To present the methodology employed to make the necessary adjustments, followed by an inspection of the firm specific attributes; (3) To state the various considerations pertaining to the data so as to understand any possible shortcomings and biases inherent in the data sample.

The share sample selected for analysis are the constituents of the Standard and Poor's Toronto Stock Exchange (S&P TSX) Composite Index as of the 31 July 2005. The data consists of a monthly stock returns, prices, accounting values and volume measures for the sample period: 31 January 1989 to 31 July 2005. Furthermore, various Canadian stock market indices and macroeconomic variables are also obtained for the construction of asset-pricing models. All data are downloaded from then DataStream International database at the University of Cape Town.[3]

The remainder of the chapter is set out as follows: Section 4.2 discusses the Toronto Stock exchange and the requirements for equities that comprise the S&P TSX Composite Index. Adjustments to the data set details of the exhaustive 904 firm specific attributes are explored, and the data considerations are stated. This section also presents the descriptive statistics of the attribute data set. Section 4.3 summarises and concludes.

[3] All data analyses and tests are performed in Econometrics Views (E-Views) statistical software package, STATISTICA software package and Microsoft Excel.

4.2. Data

Motivation for Index Selection

The focus of this thesis is the Toronto Stock Exchange (TSX), due to its well documented archive of financial data and its status as the dominant exchange within the country. More specifically, the shares included in S&P Composite index as of the 31 July 2005 have been selected for research for the following reasons.

- Data are readily available for the S&P TSX Composite Index. The index is well regarded as the proxy for the TSX, and exchange traded funds have chosen it as the benchmark portfolio for passive investing.

- The S&P Composite Index has strict rules regarding the candidate selection. Certain market values and liquidity requirements, for instance, need to be met. Existing shares in the index must strictly adhere to compliance procedures to maintain their presence.

- The accounting data available is more likely to be consistent and accurate.

- The analyst coverage of the Index is significantly higher than other stocks. Included shares are also subject to stringent corporate governance requirements.

- The stocks included in the S&P TSX Composite Index make up some 73% of the market value of the entire exchange as of the 31 July 2005.

- The index excludes investment trusts and preference shares of which trade openly and in abundance on the TSX.

An overview of the Canadian equity markets is provided in the exploratory analysis of Chapter 5.1.1. The requirements of the S&P TSX Composite Index have considerable influence on the nature of its share constituents and are discussed below.

4.2.1. Index Requirements and Stock returns data

Some of the early Canadian literature on market efficiency and asset-pricing models suggests that thin trading (Fowler, Rorke, and Jog (1980)) and data limitations (Morin (1980)) significantly hinder the validity of empirical tests. The components of the S&P Composite Index, by virtue of their stringent requirements, appear to be void of these problems encountered. The Index is subject to quarterly review whereby shares may be added or removed. Prospective firms selected as candidates for the index must comply with the following requirements for inclusion:

- Only one class of shares of the company is eligible for inclusion.
- Trading volume, value and transactions of the security for the 12 months preceding its consideration as a candidate for inclusion in the Index must be at least 0.025% of the sum of all eligible securities trading volume, value and number of transactions, as determined by trading on TSX.
- Once included, this value is reduced to 0.02% of the sum of all eligible securities' trading volume, value and number of transactions for the 12 months preceding the current month.
- The security may have no more than 25 non-trading days in the past year to be included. After inclusion, a maximum of 50 days are allowed.

In terms of size, the security must represent a minimum weight of 0.025% of the Index. The security must also have a minimum trade-weighted average price of CAD $1 over the previous three calendar months. All investment trusts and preference shares are not considered for inclusion in the S&P TSX Composite index.

The efficient market hypothesis suggests that prices of securities reflect all the available information. Given the amount of coverage of the S&P TSX Composite Index and the necessary requirements for shares to be included, it would seem that these securities would at least fit the semi-strong form of efficiency. The analyst coverage and governance mechanisms of member firms also suggest that prices at least reflect all publicly available information.

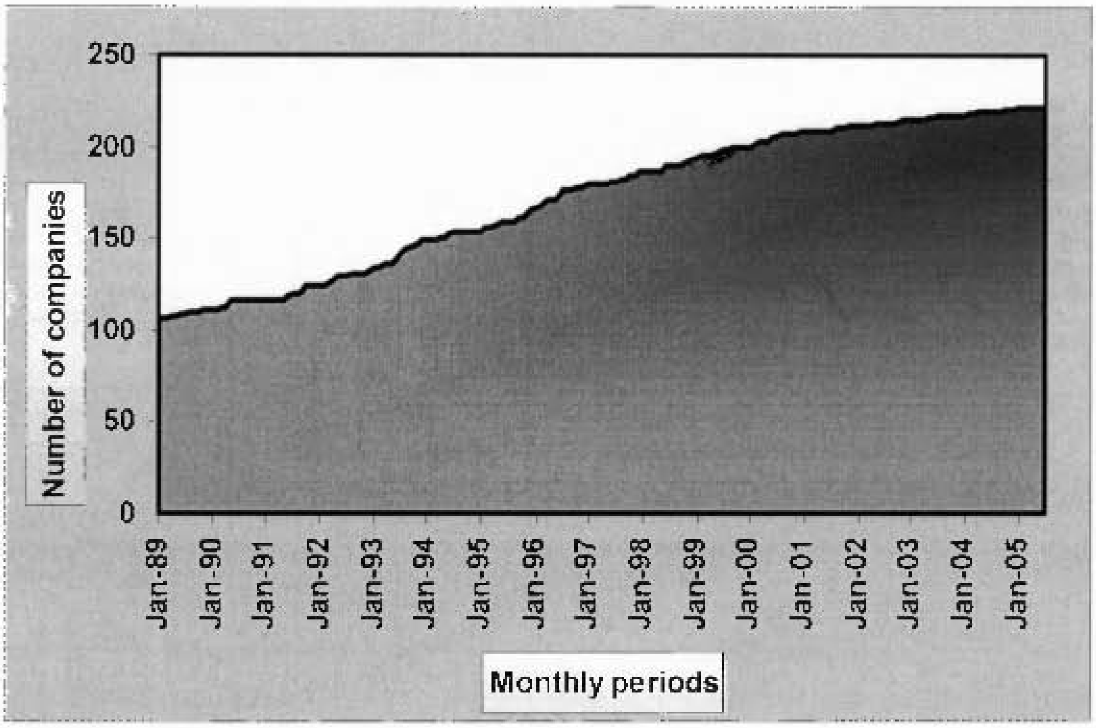
The liquidity requirements of the S&P TSX Composite Index greatly reduce the risk of thin trading as sufficient volume exists for information to be absorbed into securities' prices. Dimson (1979) and Roll (1981) notes that infrequently traded shares have downward biased covariance which results in a downward biased beta. This is intuitive since if a share price does not change (as a result of thin trading) while the market proxy does; the covariance is likely to be lower than what it should be. Non-liquid shares also usually suffer from a large bid ask spread, which may result in more volatile share price movements when the share does trade.

In order to ensure the integrity of the S&P TSX Composite Index data, each stock's turnover ratio (also known as the trading volume ratio) are examined to determine whether they are greater than 0.01% for any month. This cautionary procedure follows the same methodology as van Rensburg and Robertson (2003). All shares successfully fit the profile and no further analysis of thin trading is required.

Monthly total returns and trading volume data for the 221 shares were collected for the period 31 January 1989 to 31 July 2005. Only 106 companies of the original 221 were in existence at 31 January 1989 and increases 221 by the end of 31 July 2005. Figure 4.1 shows the number of companies included over the sixteen and a half year sample period.

Figure 4.1. Number of Companies included over the Sixteen and a Half Year Period

As at 31 January 1989, 106 companies were included in the data set. This number grows progressively to include 221 by the 31 July 2005. All companies are listed on the S&P TSX Composite index. The data were extracted from DataStream International, available at the University of Cape Town.

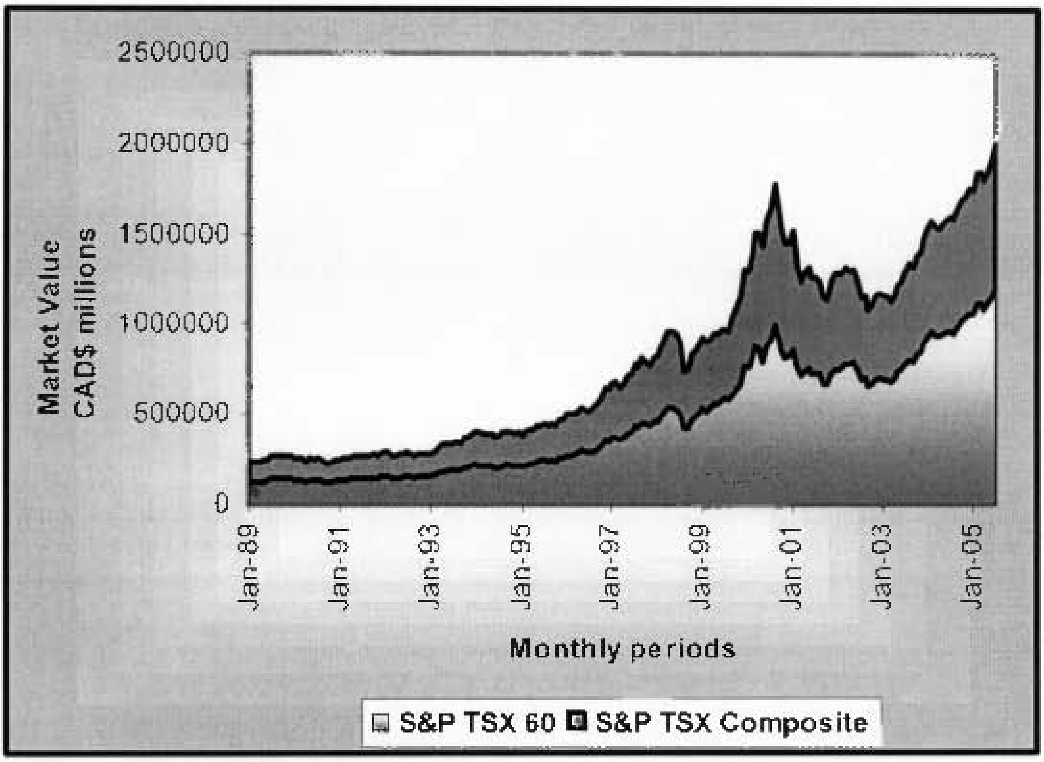


The *in* sample period is defined as data ranging from the 31 January 1989 until the 31 December 2000. The *out* sample period consists of the remaining time frame namely 31 January 2001 till 31 July 2005. The *in* sample period begins with 106 companies and ends with 200 while the *out* sample period starts with 200 companies and ends with 221.

The TSX hosts several heavyweight shares that make up the bulk of market capitalisation. The S&P TSX 60 Index consists of the largest 60 shares on the TSX according to market value. Figure 4.2 shows the market value of the S&P TSX 60 index versus the S&P TSX Composite index. At 31 January 1989, the S&P TSX 60 made up 95.73% of the S&P TSX Composite index's market value. This percentage is reduced to 66.06% at 31 July 2005, largely as a result of increased listings and non-constituent companies' growth throughout the sample period.

Figure 4.2. S&P TSX 60 versus S&P TSX Composite in terms of Market Value

The chart shows the market values of the two indices on a monthly scale from 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town



4.2.2. Adjustments to the stock returns data

Outliers in the data collected may relate to abnormal firm specific activity or be endemic to the broad market (e.g. external shocks). Outlier presence may also be attributed to data source error. Dealing with outliers deserves caution as it can be argued that so called 'outliers' are pertinent to the dataset. For example, models built with the exclusion of outliers may be deemed futile if one rare market event or company event renders the results to be drastically wrong. Significant market corrections throughout history have often wiped out most gains generated by quantitative models or other investment strategies. From an econometric standpoint, however, outliers should be removed so that they do not negatively influence the regression procedures conducted to find statistical relationships.

A two step winsorisation technique is used to treat the influence of outliers for each of the firm specific attributes and the returns data. Step one entails calculating the mean and the standard deviation cross sectionally (across all shares) for each month. Observations greater than three standard deviations from the mean are considered to be outliers and are temporarily removed from the data set. Step two quantifies a new mean and standard deviation for the new data set after the removals. The observations excluded in step one are then reintroduced to the new data set with values limited to three standard deviations of the new (step two) data set mean. The winsorisation procedure ensures that extreme outliers are 'clipped' for each month. Substantially spurious returns for each share are accounted for by placing a cap and a floor on a single month's return at positive and negative 100%.

4.2.3. Data Considerations

The attributes selected for analysis in this thesis relate partially to the findings of prior studies on style characteristics. Other attributes are constructed on the basis of general accounting financial analysis. Several important issues are raised with respect to their inclusion.

DataStream International obtains the accounting data from the Quoted Published Accounts of the companies. Consistency of the accounting data is ensured by adjusting and repositioning company accounts data for line items. DataStream International does not adjust for valuation differences as a result of changes in accounting policy. Consolidated year end results are included and interim results are only used in the certain cases as noted in appendix A.1. In the absence of consolidated results, the parent company's results are used. The accounting data is only included once the financial statements have publicly been released. This ensures that the there is no look ahead bias in the data.

Canadian listed companies financial statements must comply with the standards set by the Canadian Institute of Chartered Accountants (CICA). Reporting standards and accounting policies evolved significantly over a near 17 year period. These changes differ across the TSX sectors.

The data itself are inherently susceptible to the inconsistencies of accounting policy. It is therefore deemed necessary that some attributes are also constructed using actual cash flow from operations to offset any errors derived from accounting changes in downloaded data. Numerous attributes are also constructed twice using different accounting data in order to ensure completeness and accuracy. Varying global accounting policies and standards infer that the findings of this study may not be directly comparable to those of other countries.

Companies with missing data points are not included in any analysis for that particular month. Companies that are not listed from the beginning of 1989 also have missing data points for the periods that are not yet listed. The 'changes in style' attributes may not exhibit several months worth of data points, due to their construction process. The fewest number of monthly observations for any time series regression is 162 months, which is equivalent to three years missing out of the entire sample. Further discussions on the methodological biases are presented in Chapter Six.

4.2.4. Firm-specific attribute data

Firm specific attributes refer to a range of accounting values, accounting ratios, technical or oscillator values, return and volume measurements. An exhaustive list of 904 attributes is drawn up and can be derived from three specific sources.

The first 205 attributes relate to raw financial and accounting ratio from the DataStream International database. These attributes are traditional ratios such as the "PE ratio", "dividend yield", "return on equity" and "market to book ratio". The raw accounting data is used to construct numerous permutations of ratios. Most of these ratios are believed to show some form of economic rational and may have been documented in previous literature, or they seem to be of interest to prospective investors trying to evaluate a firm's performance. Examples of these attributes include: price to net asset value, cash flow per share, cash conversion cycle and interest cover ratio.

The second type of attribute relates to monthly or yearly changes of the attribute. These are constructed using many of the first 205 attributes to make a new attribute. For example, the change in yearly earnings is constructed to reflect the percentage change of a firm's earnings over the past twelve months. Another example would be three month or six-month price momentum. Different time frames are applied the attributes depending on their conceived relevance. The time frames applied include: one month, three month, six month, twelve month, eighteen month and twenty four month changes. This second type of attribute dramatically expands the data set by adding another 633 attributes.

The third type of attribute is similar to the first, but considers the use of the natural logarithm. The natural logarithm is applied to a select list of the first 205 attributes. An example in this case would be the natural logarithm of market value or price. Sixty-six type three attributes are added to the sample.

The attributes are assigned acronyms for the ease of statistical programming. Most attributes are abbreviated in some form or another. The prefix "Ln" is assigned to the third type of attribute and relates to natural logarithm. Attributes of the second type are followed by the "_12M" suffix, with the number referring to the quantity of months used in the construction process. A detailed list of definitions for attribute constructs is listed in Appendix A.1.

The list of first type and third type attributes that are constructed directly from accounting, technical or volume values are presented in Table 4.1 The second type attributes are shown in appendix A.3 and the methodology of construction for all three type of attributes are documented in Appendix A.2. In all cases, the acronym and the attribute name are presented. Appendix A.4. contains the descriptive statistics of the complete list of 904 attributes.

The data set compiled is the largest anomaly database known to date for the components of the S&P TSX Composite index for this sample period. The testing conducted in Chapters Six to Eight is furthermore the largest anomaly investigation among Canadian equities.

Table 4.1. Firm-specific Attributes

The table shows the list of firm-specific attributes and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data. None of the monthly changes are included in this table.

A_TURN	Asset Turnover	CFTBOR_REPAY	Cashflow to borrowings repayable
AMORT_INT	Amortised intangibles on Income Statement	CFTP	Cashflow to price
APC	Price cash ratio	CFTTOT_DEBT	Cashflow to debt
APSH	Assets per share	CH_CASH	Change in Cash
BETA	Beta	CL	Current liabilities
BOR_REPAY	Borrowings repayable in 12 months	CLPS	Current liabilities per share
BORROW_RATIO	Borrowing ratio	COGS	Cost of Sales
BTMV	Book to market value	CREDDAYS	Creditors days
CA	Current Assets	CREDTURN	Creditors turnover
CAP_GEARING	Capital gearing	CUR_RATIO	Current ratio
CAPS	Current Assets per share	DEBT_DAYS	Debtors days
CASH_EPS	Cash Earnings per share	DEBTCASHPS	Debt to cash per share
CASH_EQUIV	Cash and Cash Equivalents	DEBTNAV	Debt to net asset value
CASHDIVCOVER	Cash Dividend cover	DEBTNTAV	Debt to net tangible asset value
CASHINTCOV	Cash Interest cover	DEPCN	Depreciation
CASHNAV	Cash to Net asset value	DEPCNPS	Depreciation per share
CASHNTAV	Cash to Net tangible asset value	DEPCNTNCA	Depreciation to noncurrent assets
CASHPS	Cash per share	DEPCNTTA	Depreciation to total assets
CASHTBORREP	Cash to borrowings repayable	DFL	Degree of financial leverage
CASHTCA	Cash to current assets	DIV_PAID	Dividend paid
CASHTCL	Cash to current liabilities	DIVCOVER	Dividend cover
CASHTCRED	Cash to creditors	DOL	Degree of operating leverage
CASHTLOANCAP	Cash to loan capital repayable	DPS	Dividend per share
CASHTNCA	Cash to noncurrent assets	DTL	Degree of Total Leverage
CASHTTD	Cash to total debt	DY	Dividend Yield
CCC	Cash conversion Cycle	EBIT	Earnings before Interest and Tax
CF	Cash flow	EBITDA	EBIT depreciation adjusted
CF_MARG	Cash flow margin	EBITDAINTCOV	EBIT interest cover ratio
CFMTP	Cash flow margin to price	EBITLOAN_CAP	EBIT to loancapital
CFO	Cash flow from operations	EBITPS	EBIT per share
CFOBORREP	Cash flow from operations to borrowings repayable	EBITTCA	EBIT to current assets
CFOCASHPS	Cash flow from operations to cash per share	EBITTCL	EBIT to current assets to current liabilities
CFODIVCOVER	Cash flow from operations to dividend cover	EBITTNAV	EBIT to current assets to Net asset value
CFOLOAN_CAP	Cash flow from operations to loancapital	EBITTNTAV	EBIT to current assets to Net tangible asset value
CFONAV	Cash flow from operations to Net asset value	EBITTTD	EBIT to current assets to total debt
CFONTAV	Cash flow from operations to Net tangible asset value	EPS	Earnings per share
CFOPS	Cash flow from operations per share	EQU_RES	Equity and Reserves
CFOTCL	Cash flow from operations to current liabilities	EQUTTD	Equity and Reserves to total debt
CFOTTD	Cash flow from operations to total debt	EY	Earnings Yield
CFTLC	Cash flow to loan capital	GROW1	Sustainable growth rate1

Table 4.1. Firm-specific Attributes continued..

The table shows the list of firm-specific attributes and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data. None of the monthly changes are included in this table.

GROW2	Sustainable growth rate2	**LNNO_EE**	Natural log number of employees
INT_COVER_BT	Interest Cover before tax	**LNNPMTP**	Natural log profit margin to price
INVTURN	Inventory turnover	**LNNS**	Natural log number of shares
LCPS	Loan capital per share	**LNNTA**	Natural log net tangible assets
LNCA	Natural log current assets	**LNOP_PROFIT_ADJ**	Natural log operating profit
LNCAPS	Natural log cash assets per share	**LNOPMTP**	Natural log operating profit margin to price
LNCASH_EQUIV	Natural log cash equivalents	**LNP**	Natural log price
LNCCC	Natural log cash conversion cycle	**LNPCASHPS**	Natural log cash per share
LNCF	Natural log cash flow	**LNPE**	Natural log PE ratio
LNCFMTP	Natural log cash flow margin to price	**LNPEG1**	Natural log peg ratio
LNCFO	Natural log cash flow from operations	**LNPEG2**	Natural log peg ratio
LNCFTP	Natural log cash flow to price	**LNPNAV**	Natural log price to net asset value
LNCL	Natural log current liabilities	**LNPNTAV**	Natural log price to net tangible asset value
LNCLPS	Natural log current liabilities per share	**LNPNTAVROE**	Natural log price to NTAV * ROE
LNCOGS	Natural log cost of goods sold	**LNPREF_CAP**	Natural log preference share capital
LNCREDDAYS	Natural log creditors days	**LNPSALES**	Natural log price to sales
LNCREDITURN	Natural log creditors turnover	**LNPTCA**	Natural log price to current assets
LNCUR_RATIO	Natural log current ratio	**LNRECDAYS**	Natural log receivable days
LNDEPCN	Natural log depreciation	**LNRECTURN**	Natural log receivable turnover
LNDIVCOVER	Natural log dividend cover	**LNRI**	Natural log total return
LNDY	Natural log dividend yield	**LNSCASHPS**	Natural log sales to cash per share
LNEBIT	Natural log Ebit	**LNSNAV**	Natural log sales to net asset value
LNEBITDA	Natural log Ebitda	**LNSTTD**	Natural log sales to total debt
LNEBITPS	Natural log ebit per share	**LNTA_EMPLOY**	Natural log sales to tangible assets
LNEPS	Natural log earnings per share	**LNTOT_ASSETS**	Natural log sales to total assets
LNEY	Natural log earnings yield	**LNTOT_CE**	Natural log sales to capital employed
LNINT_EXP	Natural log interest expense	**LNTOT_CRED**	Natural log sales to total creditors days
LNINTANG_BS	Natural log intangibles on balance sheet	**LNTOT_DEBTORS**	Natural log sales to total debtors
LNINV_WIP	Natural log inventory	**LNTOT_SALES**	Natural log sales to total sales
LNMTBV	Natural log market to book value	**LNTOTAL_DEBT**	Natural log sales to total debt
LNMV	Natural log market value	**LOAN_CAP**	Loan capital
LNNCA	Natural log non current assets	**MA_12**	Moving Average 12 Months
LNNET_ASSETS	Natural log net assets	**MA_2**	Moving Average 2 Months
LNNET_DEBT	Natural log net debt	**MA_3**	Moving Average 3 Months
LNNETCASHFLOW	Natural log net cash flow	**MA_6**	Moving Average 6 Months
LNNI_ORDSH	Natural log net income to ordinary shareholder	**MA_8**	Moving Average 8 Months
LNNIAT1	Natural log net income after tax	**MA18**	Moving Average 12 Months
LNNIAT2	Natural log net income after tax charge	**MA24**	Moving Average 24 Months
LNNINAV	Natural log net income to net asset value	**MA30**	Moving Average 30 Months
LNNIPS	Natural log net income per share	**MA36**	Moving Average 36 Months

Table 4.1. Firm-specific Attributes continued..

The table shows the list of firm-specific attributes and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data. None of the monthly changes are included in this table.

MA8	Moving Average 8 months	**OBOS3MMA**	Overbought oversold 3 months
MTBV	Market to book value	**OBOS6MMA**	Overbought oversold 6 months
MV	Market Value	**OP_PROFIT_ADJ**	Operating profit
MVTRADE	Market Value traded	**OP_PROFMARG**	Operating profit margin
MVTRADEMV	Market Value traded to market value	**OP_PROFMARGIN2**	Operating profit margin 2
NAV	Net Asset value	**OPMTP**	Operating profit margin to price
NCA	Non Current assets	**ORD_DIV_GROSS**	Gross dividend
NCAPS	Non Current assets per share	**P**	Price
NCATEQU	Non Current assets to equity	**PCASHPS**	Price cash per share
NET_ASSETS	Net Asset value on Balance Sheet	**PCASHPSROE**	Price cash per share * ROE
NET_DEBT	Net Debt	**PE**	Price Earnings ratio
NETCASHFLOW	Net Cashflow	**PEG1**	Peg ratio
NETCASHPS	Net cashper share	**PEG2**	Peg ratio
NETCASHTEBIT	Net cash to EBIT	**PNAV**	Price to Net asset value
NETCASHTNIAT	Net cash to Net Income after tax	**PNAVROE**	Price to net asset value * ROE
NETCASHTTA	Net cash to total assets	**PNTAV**	Price to Net tangible asset value
NETCASHTTD	Net cashper share to total debt	**PNTAV_3M**	Price to Net tangible asset value change 3 months
NI_ORDSH	Net income to ordinary share holders	**PNTAV_6M**	Price to Net tangible asset value change 6 months
NIAT1	Net Income after tax	**PNTAVROE**	Price to Net tangible asset value *ROE
NIAT2	Net Income excluding deferred tax	**PNTAVROE_3M**	PNTAVROE 3 months
NIATTCA	Net Income to current assets	**PNTAVROE_6M**	PNTAVROE 6 months
NIATTCL	Net Income to current liabilities	**POUT**	Payout ratio
NIATTNAV	Net Income to Net asset value	**PREF_CAP**	Preference share capital
NIATTTD	Net Income to total debt	**PRNG**	Highest price for previous 12 months
NIATTTA	Net Income to total assets	**PSALES**	Price
NICASHPS	net income to cash per share	**PTCA**	Price to current assets
NINAV	Net Income to Net asset value	**PTNCA**	Price to non current assets
NINTAV	Net Income to Net tangible asset value	**QUICK**	Quick ratio
NIPS	Net Income per share	**RECDAYS**	Receivables days
NITNO_EE	Net Income per employee	**RECTURN**	Receivables turnover
NO_EE	Number of employees	**RETEN**	Retention ratio
NOSH	Number of shareholders	**RI**	Total return
NP_MARG	Net profit margin	**RND_IS**	Research and development on Income Statement
NPBT	Net profit before tax	**RNDTSALES**	RND to total sales
NPBTPOFMARG	Net Profit before tax margin	**RNDTTA**	RND to total assets
NPBTPS	Net Profit before tax margin per share	**ROCE**	Return on Capital Employed
NPBTTNAV	Net Profit before tax margin to Net asset value	**ROCOMEQU1**	Return on common equity 1
NPMTP	Net Profit before tax margin to price	**ROCOMEQU2**	Return on common equity 2
NS	Number of shares in issue	**ROE**	Return on equity
NTA	Net Tangible Assets	**ROTC1**	Return on total capitall

Table 4.1. Firm-specific Attributes continued..

The table shows the list of firm-specific attributes and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data. None of the monthly changes are included in this table.

ROTC2	Return on total capital2
SALESPS	Sales per share
SALESTP	Sales to price
SCASHPS	Cash sales per share
SHARECAP_RES	Share capital and reserves
SNAV	Sales to net asset value
SNTAV	Sales to Net tangible asset value
STCA	Sales to current assets
STCL	Sales to current liabilities
STEQUITY	Sales to equity
STNCA	Sales to non current assets
STNO_EE	Sales to number of employees
STOCK_RATIO	Stock ratio
STTD	Sales to totaldebt
TA_EMPLOY	Total assets employed
TAPS	Total assets employed change per share
TATTA	Tangible assets to Total assets
TDPS	Total debt per share
TDTNAV	Total debt to net asset value
TDTNTAV	Total debt to Net tangible asset value
TDTTA	Total debt to total assets
TLCTA	Loan capital to assets
TOT_ASSETS	Total assets
TOT_CE	Total Common Equity
TOT_CRED	Creditors
TOT_DEBTORS	Total debtors
TOT_SALES	Total sales
TOTAL_DEBT	Total debt
TV	Trading volume ratio
VO	Absolute trading volume
VOLTTRADDAYS	Volume trading days

4.3. Summary and conclusion

This chapter explores the nature of the share returns and firm-specific attribute data.

The S&P TSX Composite Index is a fair reflection of the shares of the TSX index and also takes the form of a tradable ETF. The shares are frequently traded and provide a good market proxy for Canada, as they contain securities across all major industries.

The Canadian equities selected for this study are the components of the S&P TSX Composite Index as of the 31 July 2005. The stringent requirements and review mechanisms for the index dramatically reduce the likelihood of thin trading, which has inundated previous Canadian studies. Analyst coverage, corporate governance and disclosure requirements provided by the member firms of the Composite Index point towards a stronger form of market efficiency among these shares.

Some 904 attributes are obtained or constructed using accounting, financial, volume and technical values. Both returns and attributes data sets are winsorised using a two step process, which effectively removes outlier presence. The data is subject to the survivorship bias as shares that de-listed over the period of 1989 to 2005 are omitted from the dataset.

A large number of firm-specific attributes are assembled for cross-sectional testing and other anomaly evaluation techniques in Chapters Six to Eight. The sheer size of the dataset makes this thesis the largest anomaly study to date for Canada.

-5-

Market Risk Decomposition

5.1. Introduction

The chapter aims to provide an overview of the decomposition of the Toronto Stock Exchange and provide an economic interpretation of the return generating process of listed shares. Furthermore, the multifactor framework of Canadian share returns is examined using factor analytic techniques. An APT and single-index market model are constructed and tested for accuracy over the sample period. If the models prove to be robust and explain sufficient variation of Canadian returns, they will be adopted for the risk adjustment procedures in Chapter Six, Seven and Eight.

The Toronto Stock exchange is the world's eighth largest exchange, and is well renowned for its abundance of mining and resource but also hosts a broad range of sectors. Factor analysis is conducted among both Standard and Poor's (S&P) and DataStream International sectors indices to explore the variation of Canadian equities. Cluster analysis sets out to understand the degree of association among the variables and confirm the factor analytic results.

The most correlated market sectors to the factors identified are assembled in an APT model. A single-index model is also created using the appropriate market proxy. Models are tested for goodness of fit and significance. Residuals of both the single and Multi-index model are regressed on each other to assess the source of unexplained variation.

Both DataStream and S&P indices for in and out sample periods are tested in each case. This allows for comparability of models to be scrutinized and the stationarity of APT factors to be observed. Models that prove to be sufficiently robust are to be used for risk adjustment in Chapter Six to Eight.

The rest of this chapter is set out as follows: Section 5.2 discusses the data for analysis and provides and overview of the Canadian economy, Section 5.3 states the methodology employed, Section 5.4 reports the results, and Section 5.5 summarises and concludes.

5.2. Canadian Economy Overview

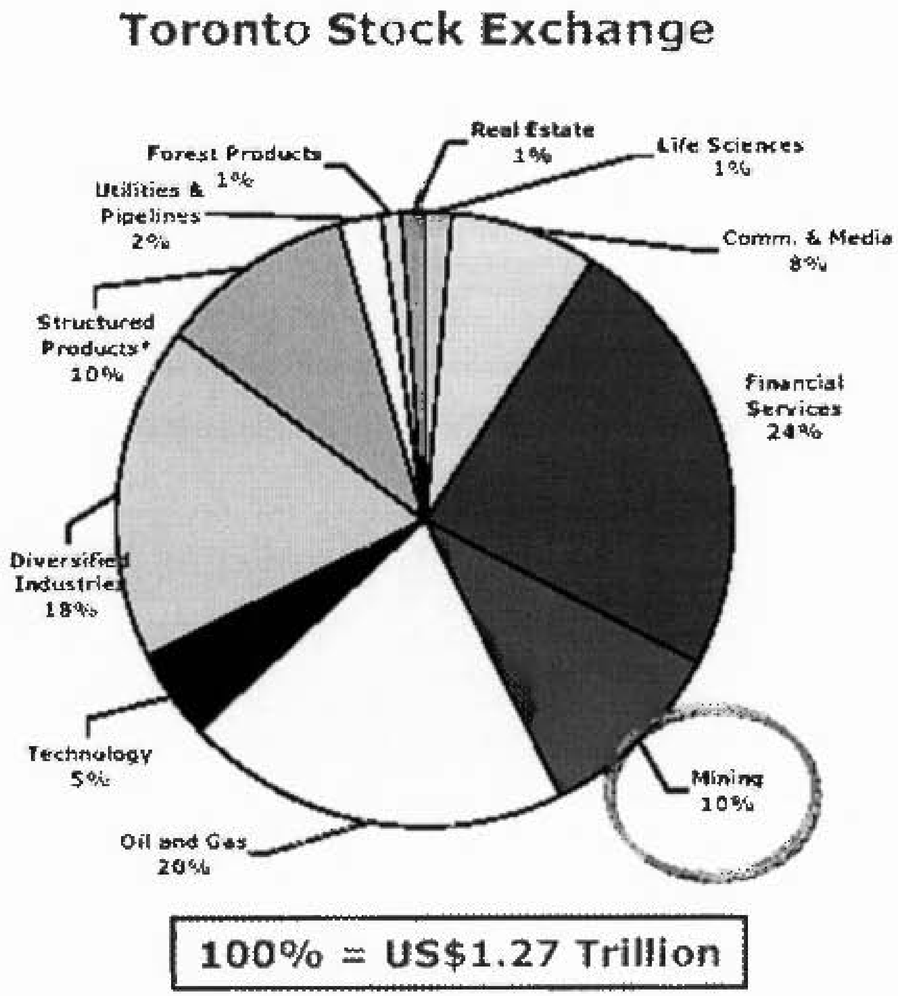
Canada is host to a number of exchanges that operate throughout the country. The Toronto Stock Exchange, situated in the financial heart of the country. Other exchanges in Canada are the Montreal, Alberta, Winnipeg and Vancouver exchanges. A wealth of financial data exists for the country and at 31 August 2005, some 4712 listed equities are traded in Canada and have financial data available on the DataStream International database.

Organized share trading in Canada began in Montreal in 1832 in the Exchange Coffee House. During 1874, it was renamed the Montreal Stock Exchange (Hatch and Robinson 1989, 229). The Toronto Stock Exchange (TSX) began in 1852, mostly using informal methods of securities trading, and was incorporated in 1878. In 1934, the TSX merged with the Standard Stock and Mining Exchange, which grew out of a merger with the Toronto Mining and Industrial Exchange. Both exchanges' initial focus was to specialize in the trading of mining stocks.

The Canadian economy has historically been based on agriculture, manufacturing and resource extraction. Since World War II the Canadian economic structure has diversified with services accounting for approximately two thirds of GDP, and primary sectors accounting for less than 10%. Primary sector contributions are linked to commodity price fluctuations. Trade with the United States remains the predominant driver of the economy which absorbs up to 80% of total exports from Canada. Manufacturing and construction accounts for about 26% of GDP and employs roughly 25% of the population. Primary sector goods such as Energy products, forestry, minerals and agriculture account for 25% of exports. Canada is the world's largest exporter of Nickel, Zinc and Uranium and in recent years natural gas, coal and oil have started to participate more substantially among exports.

Figure 5.1. Composition of the Toronto Stock Exchange

The pie chart reflects the composition of the TSX as of the 31 December 2004. The weights of the sectors are calculated according the market value as a percentage of total market value. The pie chart was obtained from the TSX Group website.

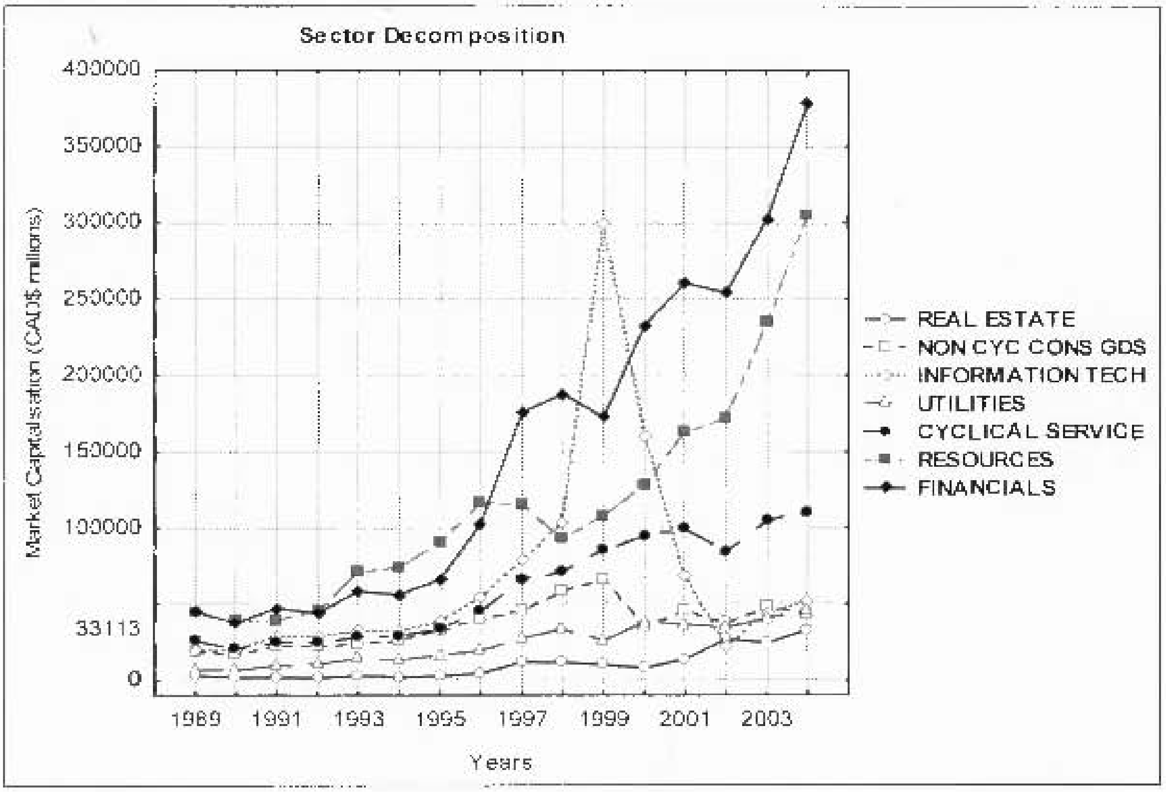


With a market capitalisation of USD$ 1.27 trillion, the TSX is the 8th largest stock exchange in the world after the Deutsche Borse, and is the 3rd larges t in North America after the Nasdaq. The TSX is made up of 1421 listed issuers of which many are very liquid. Value traded on the TSX for 2004 was USDS 649 billion. Figure 5.1 presents the different market sectors as a percentage of the total market.

Figure 5.2 below provides of some of the largest sectors in terms of market value. The rise in market value of the resources index is representative of the current commodity boom. Banks and other financial firms have witnessed the most considerable growth in the last 17 years. The formation of the IT bubble that peaked in 2000 and 2001 can be seen in the Information Technology sector's rapid rise and steep decline. Cyclical, non cyclical sectors and other basic industries have grown at a steady pace, probably reminiscent of GDP growth.

Figure 5.2. Size of Seven DataStream International Indices

Market capitalisations of seven DataStream International TSX sub-indices over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The Data are presented on a yearly scale



The Toronto Stock exchange, like other commodity producing countries' exchanges, has historically attracted resource and primary sector listings. Over time, the economy has undergone transition and shifted towards more industrial, financial and higher end service related companies.

Figure 5.3 provides a breakdown of the financial, industrial, resource and information technology sectors' market values as a percentage of the total market value. Both financials and resources allocations of total market value have increased significantly in the latter end of the near 17 year period. The Industrial market values have remained steady over the sample period, while the information technology sector's share of the total market value had been volatile having undergone the IT boom bust. It appears that whilst Canada has shifted towards a more developed service orientated economy, the TSX itself holds a large weighting towards natural resources and primary sectors. This is possibly due to its history of attracting substantial foreign resource company listings. The returns of the TSX market index thus seem to be predominantly influenced by the four above-mentioned sectors. The cluster and factor analysis delves into the influences and relationships in more detail.

Figure 5.3. Ratio of the Market Capitalisations of the four key Sectors

Market capitalisations of the DataStream International Financials, Basic Industries, Resource and IT sector indices expressed as a percentage of the total market value over the period 31 January 1989 to 31 July 2005 using monthly intervals. The data were extracted from DataStream International, available at the University of Cape Town. The indices used are calculated by DataStream International.

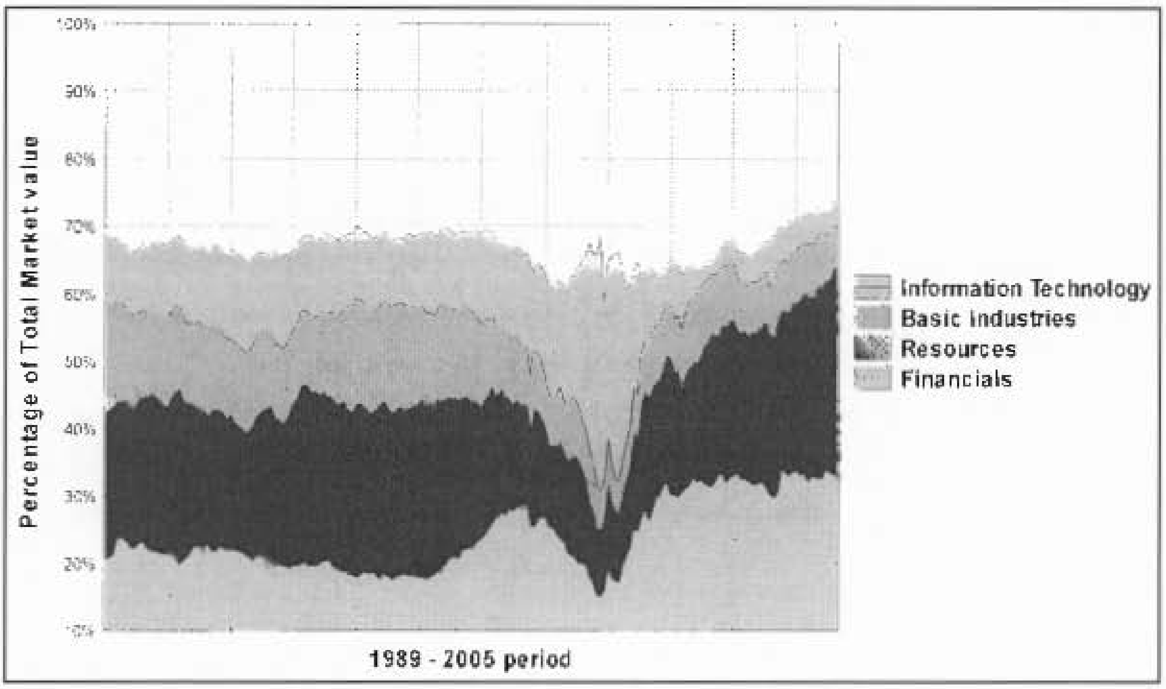
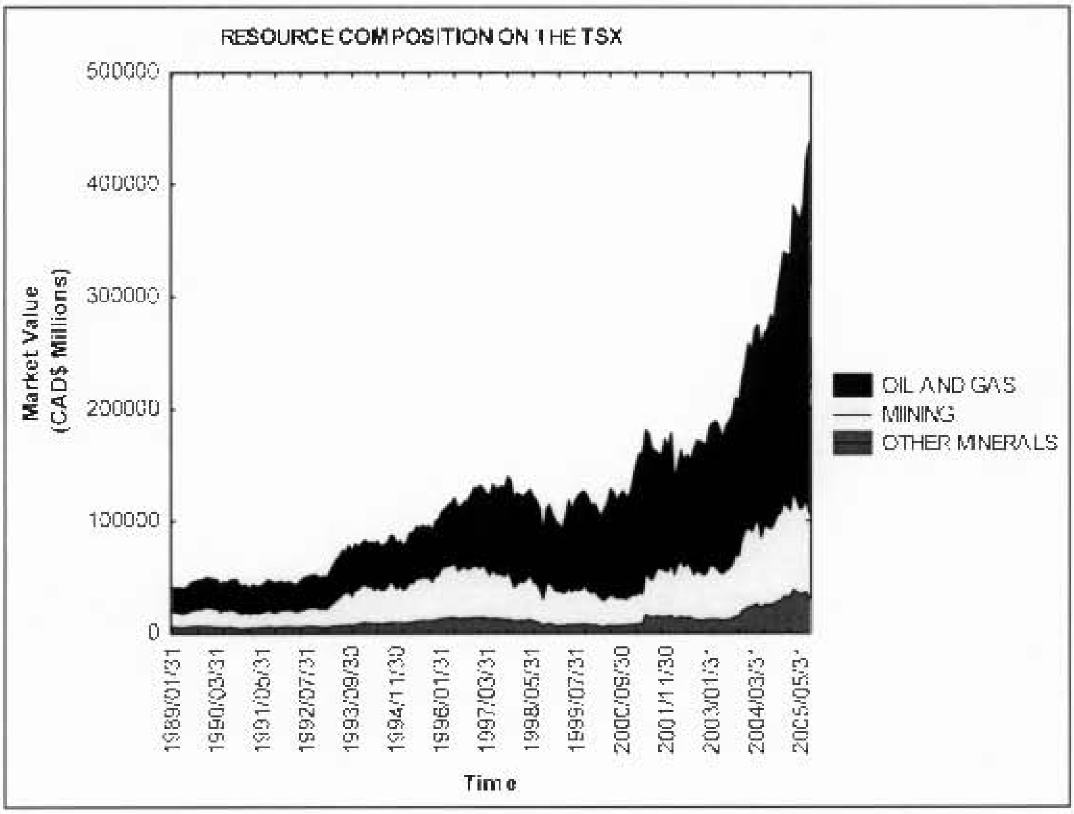


Figure 5.4 shows the market values of the major sub-indices within the resource sector. The resource sector in Canada is dominated by oil and gas, mining and other precious metals companies. Canada has large natural gas and oil reserves and the TSX (both main board and venture capital exchange) is home to the largest number (413) of mineral and gas exploration companies in the world. As of 1 January 2005, the total market value of the Oil and natural gas sector was over CAD$ 299 billion.

The mining sector and other minerals sector is made up of some 1100 listed companies (including venture capital board listings) and had a market value CAD$ 149 billion at the beginning of 2005. The TSX hosts the largest number of junior mining exploration listings (excluding energy) in the world. Gold mining makes up the largest portion of the mining sector. Other minerals sector is composed of Nickel, coal, uranium, zinc, silver, diamond and platinum companies. Figure 5.4 shows the market values of the Energy, Mining and Other Minerals sectors.

Figure 5.4. Market values of the Oil and Gas, Mining and Other Minerals sub-sectors

Market values of the three major sub-sectors within the resource sector are shown on a monthly scale over the period of 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The indices used are calculated by DataStream International.



The market values of the sub-sector indices give an indication of the growth of certain industries in Canada over the last 17 years. Table 5.1 below shows the highest and lowest growth industries according to market value over the period. The market values themselves serve merely as an indication of growth, rather than a nominal gauge. It is possible that the market value of the index itself may have increased with the inclusion of new companies into the index. Software development, oil and insurance services have experienced substantial market value growth on the TSX while general industrials, forestry and tobacco have seen little or negative growth.

Table 5.1. Highest and lowest growth sectors on the TSX

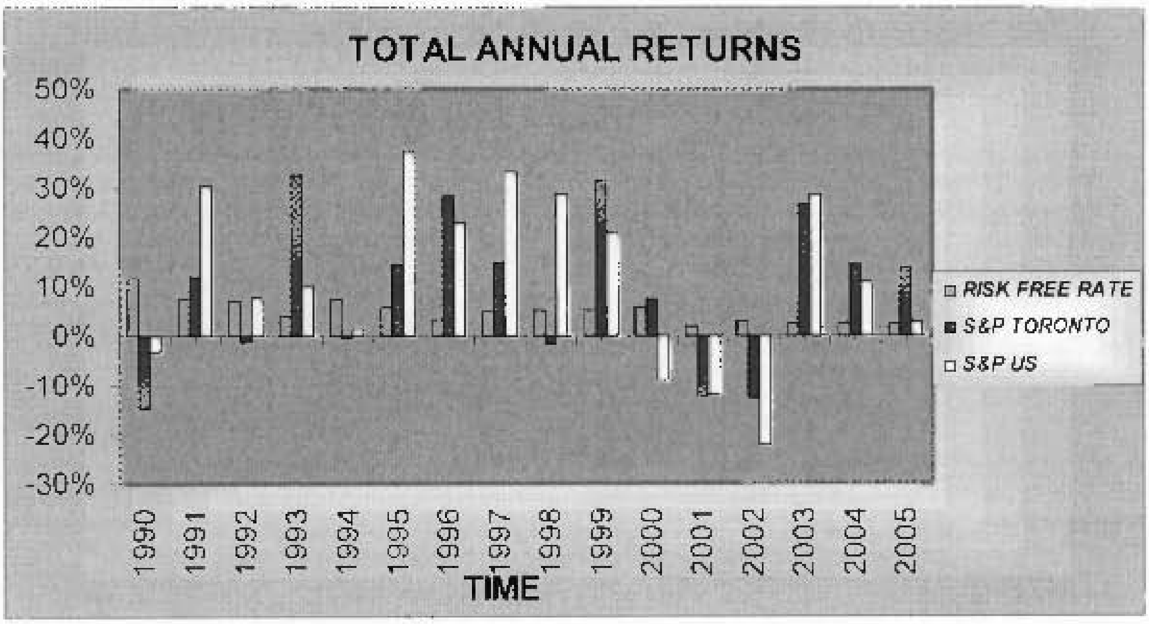
The percentage growth of the sectors are calculated using the beginning and ending market values over the 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The indices used are calculated by DataStream International.

High Growth Sectors		Low Growth Sectors	
%Growth	*Sector name*	*%Growth*	*Sector name*
162.50	COMPUTER SERVICE	-0.59	TOBACCO
159.09	OIL SERVICES	-0.39	BEVERAGES
136.21	HOUSEHOLD GOODS & TEXTILES	-0.29	SUPPORT SERVICES
117.27	LIFE ASSURANCE	-0.08	PAPER
105.22	OTHER INSURANCE	0.28	FORESTRY&PAPER
92.51	COMPUTERS	0.81	INSURANCE,NON LIFE
62.01	SOFTWARE	1.02	TELECOM EQUIPMENT
60.22	OTHER CONSTRUCTION	1.17	GENERAL INDUSTRIALS
46.99	CHEMICALS & COMMODITY	1.24	FORESTRY
38.73	CYCLICAL CONSUMER GOODS	1.28	IT HARDWARE

The S&P TSX Composite (also referred to as S&P Toronto Composite) is recognised as the benchmark for the TSX. It is also commonly used for passive investment and can be traded as an Exchange traded fund. Over the period 31 January 1989 to 31 July 2005, the S&P TSX had six years of negative returns and ten years of positive returns. The risk-free rate's decline over the 16 year period reflects the bull market for long term debt in both Canada and the United States complimented with the significant curbing of inflation in the early 1980's. The ensuing North American bull market of the 1990's witnessed high returns for almost all equity asset classes and was followed by a two year economic contraction from late 2001 to 2003. The last four years of the sample period (2001 to 2005) experienced significant commodity price appreciation of which Canada's primary sector was a major beneficiary. The S&P TSX Composite Index resultantly outperformed US market indices during this period. Figure 5.5 below provides an indication of the total annual returns on the S&P TSX, S&P US and the bankers acceptance rate (proxy for the risk-free rate. The decline of the US dollar against the Canadian dollar from 2002 to 2005 has further bolstered the real returns of Canadian equities.

Figure 5.5. Total Annual Returns of the Risk free rate and Canadian and US market proxies

The total annual returns for the Canadian risk free rate, S&P TSX and S&P US on a yearly scale. The risk free rate is represented by the Bankers 3 month acceptance rate. The data were extracted from DataStream International, available at the University of Cape Town. The indices used are calculated by DataStream International.



The high returns of both equity indices up until 2000 reflect the bull market in the United States from which Canada was a benefactor. The low interest rate environment that provided stimulus for the equity boom is also shown by the gradual interest rate decline from the high inflationary period of the early 1990's. Table 5.2 below shows the actual annual returns themselves. The periods of negative market returns for both the Canadian and US exchanges have been highlighted.

Table 5.2. Total Annual Returns of the Risk free rate and Canadian and US market proxies

The total annual returns for the Canadian risk-free rate, S&P TSX and S&P US on a yearly scale in table format. The risk-free rate is represented by the Banker's three month acceptance rate. The bold cells represent bear market years where the annual return was negative. The data were extracted from DataStream International, available at the University of Cape Town. The indices used are calculated by DataStream International.

Year	*RISK FREE RATE*	*S&P TORONTO*	*S&P US*
1990	11.66%	**-14.80%**	**-3.10%**
1991	7.48%	12.02%	30.47%
1992	7.08%	**-1.43%**	7.62%
1993	3.91%	32.55%	10.08%
1994	7.29%	**-0.18%**	1.32%
1995	5.75%	14.53%	37.58%
1996	3.11%	28.35%	22.96%
1997	4.79%	14.98%	33.36%
1998	5.00%	**-1.58%**	28.58%
1999	5.18%	31.71%	21.04%
2000	5.73%	7.41%	**-9.10%**
2001	2.08%	**-12.57%**	**-11.89%**
2002	2.83%	**-12.44%**	**-22.10%**
2003	2.63%	26.72%	28.68%
2004	2.56%	14.48%	10.88%
2005	2.66%	13.84%	2.88%

The well documented sector indices available on from the TSX provide a concise collection of data that can be analyzed for commonalities using factor analysis.

5.3. Data and Methodology

5.3.1. Exploratory analysis and Index selection

The monthly total returns on the various sector indices and sub-indices of the TSX are collected for the period 31 January 1989 to 31 December 2005. Both the S&P indices and DataStream International TSX indices are used for cluster and factor analysis. The two data sets are chosen for the purpose of comparison and to seek out the most robust model for risk adjustment in later chapters.

A total of 198 monthly returns for each Canadian S&P and DataStream index, comprising both capital gains and dividend yield (total returns), is collected for the analysis. Both indices have similar inclusion requirements and calculation methods. The cluster and factor analysis is not subject to the survivorship bias as the returns are based on the shares that made up the indices at prior dates. Construction of asset-pricing models based on survivorship are likely to present a strong set of models as the models are developed using the equities that make up the systematic proxies. The explanatory power of the single and multifactor models for the individual shares for this study is likely to be weaker, as the composition of these indices vary over time.

A large number of the S&P and DataStream indices have only come into existence since 1989 resulting in an incomplete data set. Indices and sub-indices (to be collectively referred to as '*indices*') are excluded from the data set if any of the 198 monthly returns are absent. No 'dead' indices are included. Fifty-four S&P indices of the one hundred collected are kept and forty-one indices are deleted due to a lack of data. None of the ninety-one DataStream indices are excluded. Appendix B.1 and B.2 tabulates both sets of indices.

Most of the indices data sets exhibit high correlation. A correlation filter program is run on both the S&P and DataStream data sets to eliminate indices that show extremely similarities. The filtration methodology first calculates correlation matrices for the data sets and prunes out indices that are highly correlated and of a lower index level. Indices branch out the market index (level one) and splits up into sectors and sub-sectors. The most refined and specialized sector classification occurs in level six. See appendices B.3, B.4 and B.5 for a detailed breakdown of the levels and sector constituents. Indices of a higher level take preference over lower levels in the filtration process. The index with lower classification is thus eliminated, allowing indices with greater "economic meaning" to survive. When indices have the same hierarchical classification, a subjective decision is made in order to decide which index to include. The correlation statistic used is the Pearson (1896) product moment correlation statistic (referred to as "correlation" for the remainder of the chapter) and is calculated as:

$$r_{j,k} = \frac{\sum_{t=1}^{n}(j_t - \bar{j})(k_t - \bar{k})}{\sqrt{\sum_{t=1}^{n}(j_t - \bar{j})^2 \sum_{t=1}^{n}(k_t - \bar{k})^2}} \tag{5.1}$$

where j_t and k_t are the total monthly returns for the indices in month t for any two indices. $\bar{j}$ and $\bar{k}$ are the mean monthly returns of those indices, and n is the number of months.

The final list of condensed indices to be used in factor analysis is presented in table 5.3 below.

Table 5.3. Canadian Stock Exchange Sector and Sub-sector Indices

The table displays the Canadian Stock Exchange (TSX) sector and sub-sector indices included in the cluster and factor Analysis. A correlation filter program prunes out indices that are highly correlated and are given preference to selecting those of a lower index hierarchical level. See appendix B.3 to B.5 for the hierarchical levels applicable to Canada.

Included S&P Indices	Included Datastream Indices
BUILDING PRODUCTION	AIRLINES & AIRPORTS
ENERGY	ENGINEERING CONTRACTORS
FOOD PRODUCERS	GENERAL INDUSTRIALS
FOOD DISTRIBUTOR	IT
GENERAL RETAIL	OTHER FINANCIALS
HEALTH CARE	MINING
HEALTH FACILITIES	NON-FERROUS METALS
INSURANCE	OIL INTEGRATED
IT	OTHER INSURANCE
METALS & MINING	PAPER
REAL ESTATE	PHARMACEUTICALS
RETAILING	RESOURCES
SOFT DRINKS	RETAILERS
STEEL	SOFTWARE
COMPOSITE INDEX	STEEL
	ENTERTAINMENT
	TELECOM WIRELESS
	FINANCIALS
	MARKET INDEX

5.3.2. Cluster Analysis

Cluster Analysis involves the grouping of the indices into different categories in order to organize them into meaningful structures. Cluster analysis itself is an exploratory tool that sorts variables in a data set so that the degree of association between two variables is maximised. The analysis investigates similarities in the data set, without

necessarily drawing any economic inferences to why the variables are part of the same group.
Ward's method uses an analysis of variance (ANOVA) approach to evaluate the distances between clusters. This approach attempts to minimize the sum of squares of any two clusters that can be formed at each step. At inception, the clusters number the same quantity of individual variables (in this case the variables relate to the indices). Variables are compared in terms of their correlation (Pearson's (1896) product moment correlation statistic) with each other and merged to form a cluster if they are highly similar. Each iteration produces fewer clusters through the 'amalgamation' of increasingly dissimilar elements of the data set. Finally, a vertical tree diagram is created in order to visually inspect the clustering process. The number of clusters to be extracted is decided by using an arbitrary cut-off line.

The indices (and sub-indices) are the variables. Each cluster represents indices that show similarity in terms of their return generating structure. Therefore, two highly correlated indices will have a short distance that will result in amalgamation to create a new cluster. Certain sub-indices that are exposed to economic conditions, which affect their underlying asset values in a similar way, are expected to be grouped together.

The cluster analysis per se is not a statistical means of identifying different factors that explain the variation common amongst variables in a set of data. The cluster analysis, however, does provide an indication of the variables that do behave similarly in the data set.

5.3.3. Principal components analysis

Factor analysis is the procedure used to identify elements that collectively explain variation within a data set. Prespecified variable selection entails testing the sensitivity of share returns to a set of selected variables. Principal components analysis defines common underlying dimensions in a data set (known as factors) by using an interdependence technique that simultaneously considers all variables. Factor analytic techniques are believed to be more appropriate for the purposes of this study.

Criticisms of factor analysis include: (i) the determination of how many factors to include. The number of factors extracted may also be influenced by the number of observations and number of shares in the sample, (ii) the lack of guaranteed factor consistency across shares and portfolios, (iii) the factors derived may be mere statistical constructs and are not necessarily observable, (iv) the factors themselves may not have economic rationale (McElroy and Burmeister,(1998)), (v) the variables selected for the analysis may be subject to data snooping, and (vi) economic relationships represented by factors may be subject to change over time.

van Rensburg and Slanely (1997) and van Rensburg and Zhu (2000) find that the financial-industrial and resource indices may be employed as observable proxies for the factor analytically extracted factors on the Johannesburg Stock Exchange (JSE). The returns of the large resource companies, financials and industrials are driven by differing economic conditions, and parsimoniously explain most of the JSE variation . The Toronto Stock exchange similarly exhibits a wide variety of companies, most of which can be categorised as resource, financial and industrial and IT. The factor analytical approach thus follows the above mentioned authors' methodology.

The principal components analysis used in this paper forms part of the a correspondence analysis which aims to explore and describe the structural dimensions of a data set as opposed to confirm them. The purpose of the tests are to discover factors which provide explanatory power to the underlying data set in order to aid the construction of a multifactor market model as well as to possibly provide economic rationale for these factors.

Principal components analysis is essentially a data reduction technique that aims to create factors by linear combinations of variables in the data set. The extraction process of principal components amounts to a variance maximizing (varimax) rotation of the variable space. This allows the maximisation of the variability of the new factor and minimising the variability around that factor. After the first factor has been extracted, the analysis creates another factor that maximises the remaining variance unaccounted for by the first factor. Consecutive factors are independent or otherwise known as orthagonal. Variables can only be assigned to one factor. Factors thus represent a group of indices that 'behave' similarly. The correlation between variables and factors are referred to as loadings.

Normalized varimax rotation is used in order to create the factors. The rotation procedure ensures variance maximisation on each new axis. The factor loadings are then inspected to assess which indices are most related to each factor.

The number of factors to be extracted can be determined in a number of ways. The Kaiser criterion suggests using factors with eigenvalues greater than one. The scree test which plots the eigenvalues, indicates how much explanatory power every factor adds. The factor before which the scree plot starts to flatten out can be used (Cattel and Jaspers, 1967) or the factor at which it flattens out (Hair, Anderson, Tathom and Black, 1999) is regarded as the cut off point. Finally, the percentage of variance criterion suggests that a subjective target of cumulative percentage of variance should be determined. The purpose of principal component extraction is data reduction and therefore the trade-off exists between the inclusion of many factors that explain the entire data set, and a few factors that explain the majority of variation.

As reflected in the earlier charts, weightings of indices (based on market value) on the TSX, differ over time as underlying economic trends change. This 'nonstationarity' is likely impact the relevance of extracted factors as time progresses. Factor analysis is conducted on the entire study period 1989 to 2005. An *in* sample period (1989 to 2000) and *out* sample period (2001 to 2005), is further conducted for comparability and to inspect the effects of the nonstationarity.

5.3.4. Construction of an APT model

The methodology of van Rensburg and Slaney (1997) and van Rensburg and Zhu (2000) is used in the construction of the APT model. The indices with the highest loading to the extracted factors from the principle components analysis and subsequent rotation procedures are used as proxies for the APT factors. This gives the proxies of the APT model greater economic rationale than the extracted factors themselves.

5.3.5. Testing the Single and Multi-index models

Equity monthly returns data over the period 31 January 1989 to 31 July 2005 (total sample) are obtained for the 221 companies that comprise the S&P Composite Index. The returns are not adjusted for outliers in this chapter.

The testing of the single-index model requires a suitable market proxy and risk-free rate. The market proxies chosen are the S&P Composite Index and the DataStream International market index. A correlations coefficient for the two indices amounts to 0.99 and reveals that the two indices' return generating process is almost identical. The same correlation test was performed for each index with that of the S&P United States index. The DataStream International and S&P TSX Composite Index record correlations of 0.9484 and 0.9555 respectively. This relationship illustrates the influence of the United States on the Canadian economy as a major importer and business partner.

The Banker's three month acceptance rate is selected as the risk-free rate proxy due to its data availability and its high correlation with treasury bills and other short term government paper issued in recent years.

The testing of the single-index model aims to assess the explanatory power of the model against the time series of individual company's returns. Excess monthly share returns are regressed against the market proxies excess return (risk premium) using the Ordinary Least Squares method. The returns follow a time series format. The equation used is:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

where:

$r_{i,t}$ = *realised return on share* i *for month* t

α_i = *constant intercept term*

β_i = *slope coefficient estimated from the regression*

$r_{m,t}$ = *realised return on the market for month t*

$r_{f,t}$ = *risk-free rate for month t*

$\varepsilon_{i,t}$ = *residual error*

The Multifactor model testing followed the same regression procedure with the following equation.

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{Index1,i}(r_{index1,t} - r_{f,t}) + \beta_{Index2,i}(r_{index2,t} - r_{f,t})..$$
$$+\beta_{indexK,i}(r_{indexK,t} - r_{f,t}) + \varepsilon_{i,t}$$

The $r_{i,t}$ and $r_{f,t}$ terms are the realised share return for share i and the risk-free rate respectively. The $r_{index,t}$ terms are the returns for the K indices over the period t.

For both the single and multifactor model regressions, the coefficient, coefficient t-statistics and p values are collected. Furthermore, the R^2, an R^2-adjusted, F test p value and a time-series of residuals are gathered.

Once again, both DataStream International and the S&P factors are separately regressed against all excess returns for comparability. In sample and the out sample regressions are preformed to assess the robustness of factors in both periods, as well as to analyze the possible effects of nonstationarity.

The models can be evaluated according to their goodness of fit (R^2 and R^2-adjusted) and compared amongst each other. Furthermore, the residuals of the single-index model are regressed against that of the multifactor model (and vice versa) to test whether any variation unexplained by one model filters through to the other. The R^2, an R^2-adjusted, F test p value are used to evaluate this residuals test.

5.4. Results

5.4.1. Cluster analysis

Figure 5.6. Vertical Tree Diagram of Cluster Analysis Results for DataStream Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 19 DataStream International sector and sub-sector indices for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005. The data were extracted using DataStream International, available at the University of Cape Town. Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3 for the full names of the indices.

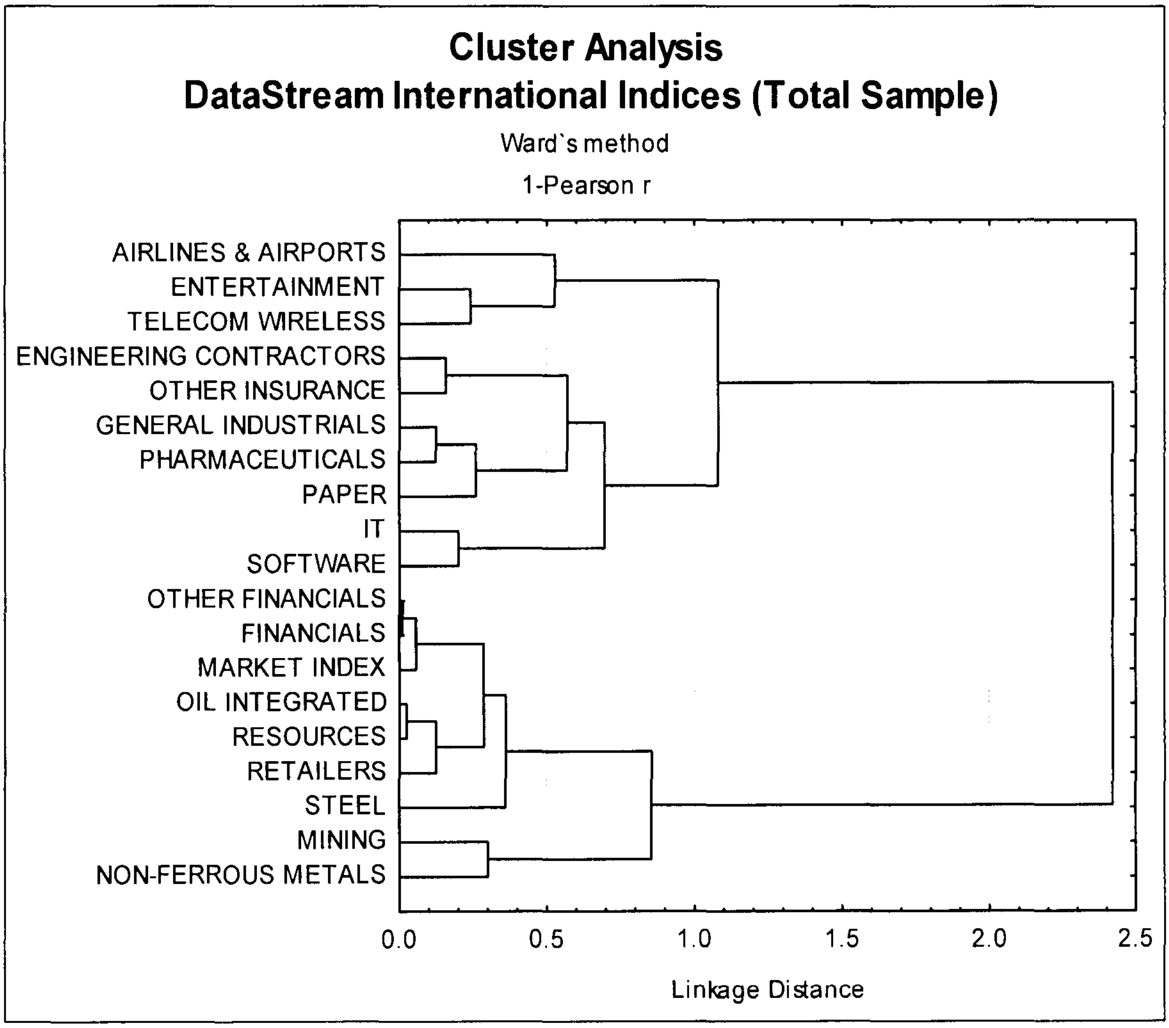
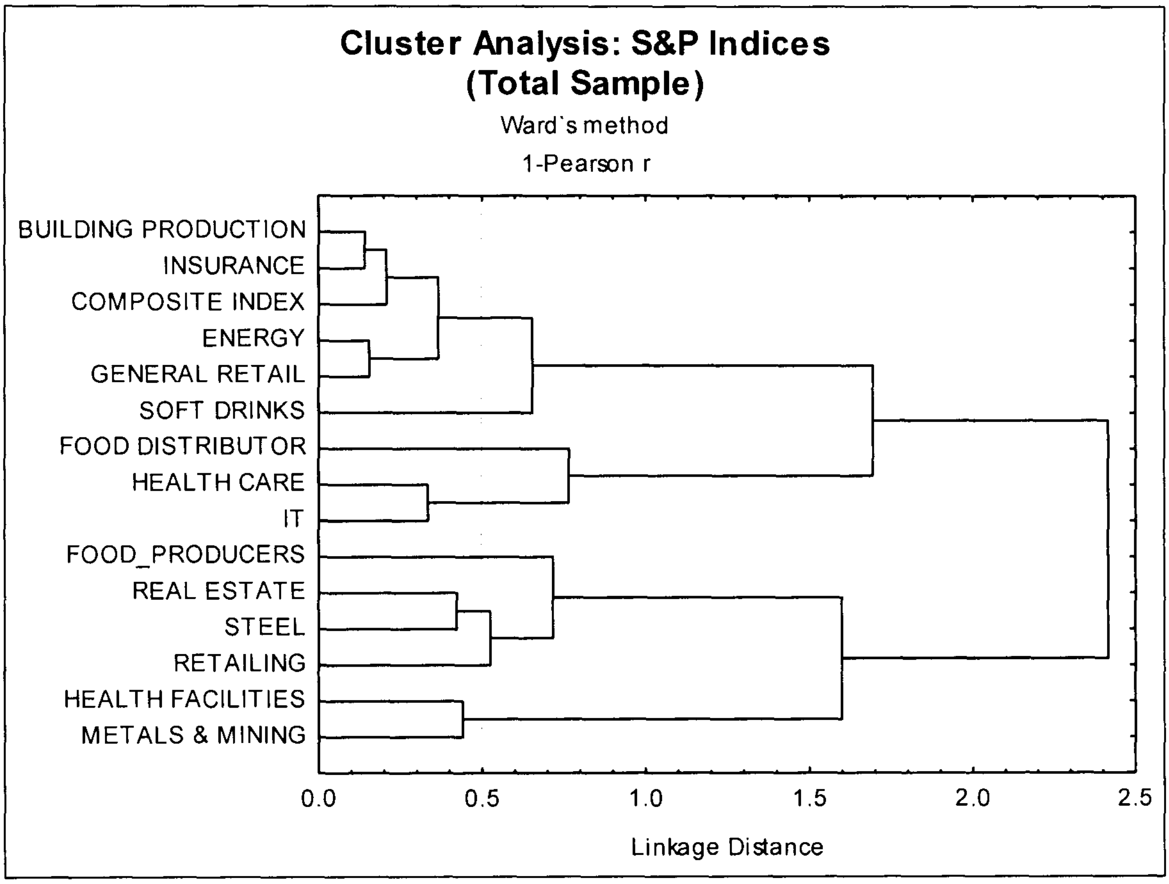


Figure 5.7. Vertical Tree Diagram of Cluster Analysis Results for S&P Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 15 S&P International sector and sub-sector indices for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005. The data were extracted using DataStream International, available at the University of Cape Town. Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3 for the full names of the indices.



The results of the cluster analysis for the DataStream international indices are illustrated in Figure 5.6 The y-axis to the graph represents the Linkage distance between the different clusters. The size of the link reflects the degree of association of one cluster with another. A large linkage distance thus infers greater dissimilarity. Cluster formation begins at the bottom, on the base of the x-axis and move upwards.

From initial inspection, two distinct clusters appear to form in the diagram. These clusters are represented by general sub-indices: (i) General industries, Telecom Wireless and IT; and (ii) resources, mining and financials.

The S&P indices tree clustering is shown in Figure 5.7. Initial inspection reveals two similar clusters pertaining to (i) Healthcare, retail and oil; and (ii) Mining and real estate. The clustering of S&P sectors appears to be more vague in this case. The clusters do however appear to reinforce the notion of a primary and secondary sector dichotomy.

In and *out* sample cluster analyses for DataStream and S&P Indices are presented in Appendices B.6 to B.9. The in and out sample diagrams present a similar picture as the total sample. Indices tend towards two common factors within the data set. This is in agreement with the findings of Kryzanoski and To (1983) who find that two factors sufficiently explain the bulk of sector variation. The results also start to show the beginning of a third cluster formation, namely, Information Technology (IT). This new cluster is arguably a product of the IT boom bust of the late 1990's and saw IT shares returns depart from fundamental valuations with extreme values on both the up and the down side.

The cluster analysis presented is merely a preliminary test to visually assess the similarities and dissimilarities of the sub-indices in the data sets. Factor analysis will prove to provide further insight to which indices have the greatest factor loadings to the return generation dichotomy witnessed.

5.4.2. Principal components analysis

The following results and analysis refer to the S&P data set.

The Kaiser's criterion suggests that an Eigen value greater than one should be used to determine the number of factors to be extracted for the S&P dataset. Four factors lie above the one value and are identified for extraction. The scree plot in figure 5.8 shows the Eigenvalues on the y-axis. The plot begins to flatten out after a fifth factor is added. Four factors are thus extracted in accordance with Cattell and Jaspers (1967) and the Kaiser criterion. Table 5.4 portrays the eigenvalues and the percentage of cumulative variation explained by the factors. After the inclusion of 4 factors, almost 86% of the total variation in the data set is explained.

Figure 5.8. Scree Plot of Eigenvalues for S&P Indices

The Scree plot presents the Eigenvalues of the factors derived from principal components analysis using the total monthly returns of 15 S&P sectors and sub sector indices over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. Of the initial 100 included indices, 85 are excluded due to multicollinearity. Four factors can be extracted once the eigenvalues begin to flatten out (Cattell and Jaspars (1967)).

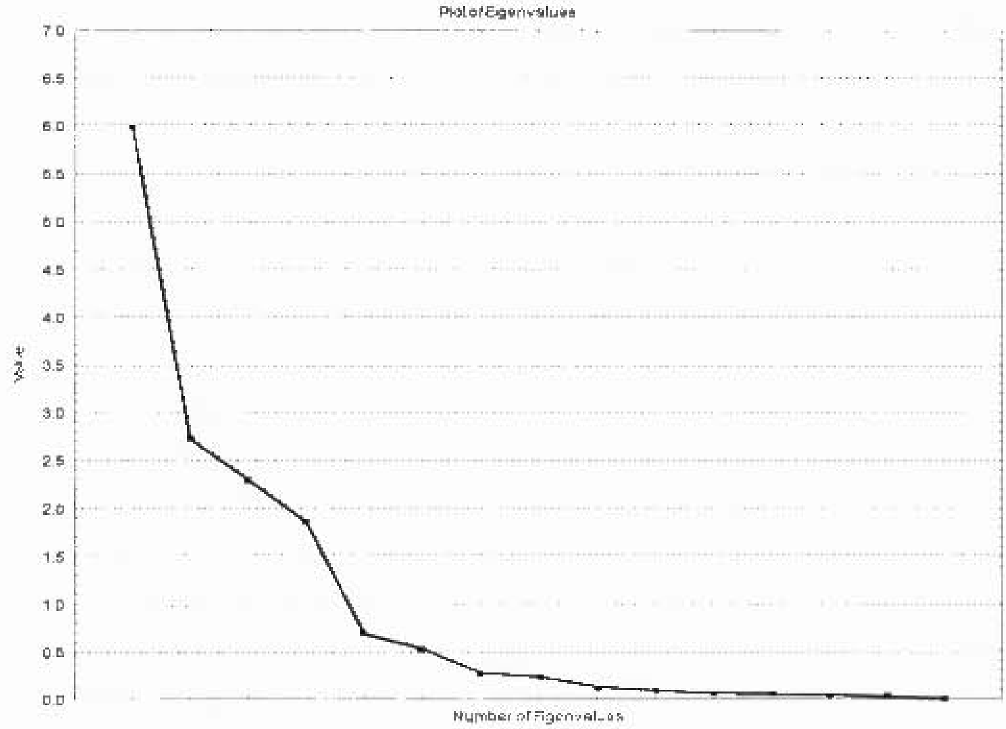


Table 5.4. Eigenvalues and Percentage Variation Explained by the Four S&P TSX Factors

The table above shows the results of principal components analysis on the total monthly returns of 15 Standard and Poors Toronto Stock Exchange (S&P TSX) sector and sub-sector indices over the period, 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town Of the initial 100 included indices, 85 are excluded due to multicollinearity.

Factor	Eigenvalue	% Total Variance	Cumulative Eigenvalue	Cumulative %
1	5.99	39.91	5.99	39.91
2	2.72	18.15	8.71	58.06
3	2.30	15.32	11.01	73.38
4	1.86	12.39	12.87	85.77

Varimax rotation is used to maximise the factor's ability to explain the total variation. The two dimensional factor loading plot presented in Appendix B.10 gives an indication of where each index lies in relation to these factors. The plot shows which index is the most closely associated with each factor. The market index falls almost directly between the two factors and verifies the dichotomous market structure.

Correlations between indices and factors (factor loadings) are shown in Appendix B.11. Table 5.5 displays the indices with the highest factor loading.

Table 5.5. Varimax-rotated Factor Descriptions

The table above shows the results of principal components analysis on the total monthly returns of 15 Standard and Poors Toronto Stock Exchange (S&P TSX) sector and sub-sector indices over the period, 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town Of the initial 100 included indices, 85 are excluded due to. Varimax rotations are used and the index with the highest loading to each factor is displayed. All indices listed below had at least a loading of 0.800 on their respective factor.

Factor	Actual index	factor Description	correlation
Factor 1	Energy Index	Natural gas & oil companies	0.92
Factor 2	IT	IT and Software	0.81
Factor 3	Metals & Minerals	Mining	0.84
Factor 4	Retailing	Consumer retailing	0.81

The first factor's highest loadings consisted of energy and oil industries, general merchant stores and soft drinks. The second factor was most closely associated with IT, software and, oddly enough, healthcare. The third and fourth factor's highest loadings consisted of Metals & Minerals and Retailers respectively. The indices provide a greater economic motivation for the four factors and are thus selected as risk proxies in the S&P APT model construction.

The following results and analysis pertain to the DataStream International data set.

The Scree plot is presented in figure 5.9 and flattens out after 4 factors. The Cattell and Jaspers (1967) and the Kaiser criterion factor extractions techniques again suggest that either three or four factors should be selected. The 4th factor lies just below Eigenvalue one, but is included as the plot flattens out after its inclusion. The first factor accounts for 58% of the total variation and after the 4th factor, almost 89% of the variation in the data set is explained. The first factor in the DataStream International data set has noticeably more explanatory power than that of the S&P indices. Tables 5.6 displays the eigenvalues and cumulative percentages while table 5.7 shows the indices with the highest factor loadings to the extracted factors.

Figure 5.9. Scree Plot of Eigenvalues for DataStream Indices

The Scree plot presents the Eigenvalues of the factors derived from principal components analysis using the total monthly returns of 19 DataStream sectors and sub-sector indices over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. Of the initial 91 included indices, 72 are excluded due to multicollinearity. Four factors can be extracted once the eigenvalues begin to flatten out (Cattell and Jaspars (1967)).

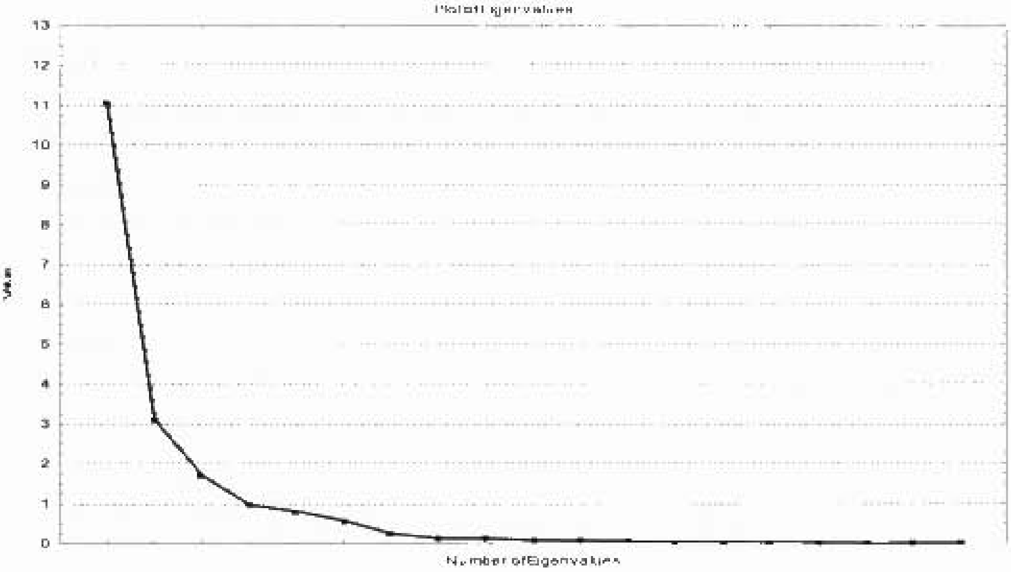


Table 5.6. Eigenvalues and Percentage Variation Explained by the First Four DataStream International factors

The table above shows the results of principal components analysis on the total monthly returns of 19 DataStream sector and sub-sector indices over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.Of the initial 91 included indices, 72 are excluded due to multicollinearity.

Factor	Eigenvalue	% Total Variance	Cumulative Eigenvalue	Cumulative %
1	11.03	58.08	11.03	58.08
2	3.12	16.42	14.16	74.50
3	1.72	9.05	15.87	83.55
4	0.97	5.12	16.85	88.67

Table 5.7. Varimax-rotated Factor Descriptions

The table above shows the results of principal components analysis on the total monthly returns 19 DataStream sector and sub-sector indices over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. Of the initial 91 included indices, 72 are excluded due to multicollinearity. Varimax rotations are used and the index with the highest loading to each factor is displayed.

Factor	Actual index	factor Description	correlation
Factor 1	Oil integrated Index	Natural gas & oil companies	0.95
Factor 2	Engineering contractors	Engineering	0.81
Factor 3	IT	IT and Software	0.83
Factor 4	Mining	Mining	0.87

The factor analysis on the DataStream International indices provides somewhat similar results to those of the S&P Indices. Factor 1 is closely associated with the Oil industry, Resources, Financials and Retailers. Factor 1 appears to represent a far larger portion of the total market's variation. Factor 2 is characterized by Engineering, other insurance and general industrials. The two factors cumulatively explain almost 75% of total market variation. Factor 3 and 4 show close association to the IT and mining sectors respectively.

The factor analysis appears to show some signs of a dichotomy of commodity related companies and others existing on the TSX. This dichotomy is by no means clear, as resource related companies returns (especially Oil) do appear to follow the movements as financials and retailers or vice versa. The factor plot in Appendix B.12. shows that the market index for DataStream International lies somewhere in the middle of the first two factor loadings reinforcing the market dichotomy proposition. The factor loadings are presented in Appendix B.13.

Indices such as Oil and Gas (derived from Factor 1) seem to carry significant explanatory power for the entire data set. The Retail and the broad Financial sectors show a surprisingly high correlation to Factor 1 (The Oil and Gas proxy) . It seems unlikely that a causal relationship should exist between the return structure of the Oil sector and Financials or vice versa and it appears that it may be spurious. A potential economic argument for this relationship is that a commodity producing country's prosperity is arguably linked to the price of commodities. If the Oil and Gas industry benefits from higher prices, the country is likely to benefit from export revenues, tax revenues, foreign investment and the like. Figure 5.3 shows that the two sectors have grown at a similar pace over the near 17 year period.

The four indices most closely associated with the four derived factors are applied in the DataStream APT model construction.

5.4.3. Construction of an APT model

A four-factor APT model is constructed using the same methodology of van Rensburg and Slaney (1997). The use of indices as proxies and not the factors themselves aims to provide better economic rationale to the APT as the indices are directly observable. Both in and out sample APT models are created for both the DataStream indices and S&P indices. This allows for non-stationarity assessment of the proxies in different time periods. The *in* sample period is from 31 January 1989 to 31 December 2000. The *out* sample *period* is the remaining period of data between 31 January 2001 and 31 July 2005.

The S&P APT model uses the following indices as proxies: (1) Energy; (2) IT; (3) Metals & Minerals; and (4) Retailing. The DataStream APT model's proxies consist of the (1) Oil Integrated; (2) Engineering contractors; (3) IT; and (4) Mining.

5.4.4. Evaluation of the Single and Multi-Index models

Single and multi-index models are constructed for DataStream and S&P Data sets. Total, In and out sample periods are further examined for each. Twelve sets of evaluation tests are thus conducted.

The Single-index model is tested by running the time series regression of each share's monthly excess returns against the monthly market premium. The monthly market premium refers to market proxy (S&P TSX Composite Index or DataStream Market

Index) less the three month bankers acceptance rates monthly return.

Similarly, the Multi-index model results refer to the time series regression of the each shares' excess monthly returns against the four indices excess return. The respective indices for both S&P and DataStream data sets are discussed in section 5.3.1.

In each case, results are documented in table format. Both Single and Multi-index results are reported on the same table. The Multi-index model's residuals are regressed against the single-index model and vice versa. The residuals regressions explore which asset-pricing model explains the portion of returns that the other was not able to.

The means or averages of the R^2, *R^2-adjusted, and p-values across* all 221 shares are shown in the first three columns of the table. The number of regressions significant at the 5% level ($p < 0.05$) as a percentage of the total number of regressions is displayed in the last table column.

Tables 5.8 and Table 5.9 display the results of the S&P and DataStream data set respectively. The model tests conducted on in and out sample periods are presented in Appendices B.14 to B.17.

Table 5.8. S&P Single and Multi-index Models tests for the Total sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the S&P TSX Composite Index. The APT factor indices used are (1) Energy; (2) IT; (3) Metals & Minerals; and (4) Retailing

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSIONs SIGNIFICANT AT 5%
Single-index Model	0.11	0.10	0.04	0.83
Multi-index residuals on single-index model	0.01	-0.002	0.48	0.05
Multi-index model	0.21	0.17	0.05	0.79
Single-index residuals on Multi-index model	0.13	0.08	0.17	0.53

The multi-index model's (from here on referred to as the APT model) mean R^2 and adjusted R^2 for the total period are higher than that of the single-index model suggesting that the APT model is better at explaining the return generating process over the total sample period. This is confirmed by the APT model's ability to explain a comparatively larger portion of the single-index models residuals. The single-index model's mean p value and number of significant regressions are marginally better than those of the APT. Both models, however, provide evidence of sufficient explanatory power.

The outcomes of the in and out sample tests are tabulated in Appendices B.14 to B.17. Both single and multi-index models perform better in the *in* sample period with higher $R^{2'}$s but witness a minor reduction in regressions significant at 5%. The APT model appears to explain more of the single-index model's residuals.

In terms of $R^{2'}$s, the single-index models seems to fare worse in the out sample period while the APT model shows marginally improved performance. Both models have fewer regressions significant at 5% which indicates that less of the shares' return structure, over the last 5 ½ years, is explained by the models. The APT model explains more of the single-index models residuals in both the in and out sample when compared to the total period. Furthermore, the APT model's out sample explanatory power rises as the single-index models falls. These observations imply that the APT model captures variation that the market model is unable to.

The out sample period consisted of 2 ½ years of bear market followed by 3 years of bull market. The in sample period, which relates to the 1990's consisted mostly of bull market for the United States and Canada. Given the strongly diversified nature of the markets and the proxies used, the sharp downturn may have affected certain shares (such as IT) comparatively more than the market index. This may justify why the APT (which contains and IT factor) is a more robust model and is able to explain the single-index's residuals.

The percentage of regressions significant at 5% declines for both models in the out sample period. This may suggest that the explanatory power of the asset-pricing models erode somewhat and possibly indicates nonstationarity. Table 5.9. reports the

DataStream sample results.

Table 5.9. DataStream Single and Multi-index Models tests for the Total sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the DataStream Market Index. The APT factor indices used are (1) Oil Integrated; (2) Engineering contractors; (3) IT; and (4) Mining.

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSIONs SIGNIFICANT AT 5%
Single-index Model	0.11	0.10	0.04	0.80
Multi-index residuals on single-index model	0.01	0.005	0.36	0.17
Multi-index model	0.19	0.15	0.06	0.78
Single-index residuals on Multi-index model	0.12	0.07	0.20	0.47

The DataStream data set results show distinct similarities to those of the S&P data set. The APT models shows better explanatory power than that of the single-index models in terms of R^{2}'s and the trends discussed for the S&P data set are repeated. The DataStream models however do seem to show poorer explanatory power than the S&P models.

The multi-index model throughout all the tests shows higher R^{2}'s and adjusted R^{2}'s than that of the single-index model. The adjusted R^{2}'s are calculated after the removal of degrees of freedom and allow for better model evaluation when more independent variables are added. The single-index- model exhibits lower mean p values and higher number of regressions significant at 5% for both total and *in* sample periods.

The multi-index model shows greater out sample significance. The multi-index model explains significantly more of the residuals of the single-index model. The APT results confirm those of the S&P and provide a strong case for its preference to the market model.

The regression results conducted are in contrast to the early CAPM findings in Canadian literature. The time series regression results disagree with those of Morin (1980), Robinson (1993b) and Calvet and Lefoll (1980). The authors do note that data limitations and thin trading problems were experienced in their testing, all of which, are unlikely to affect the S&P and DataStream samples.

Hughes (1984), Abeysekera and Mahajan (1987), and Smith (1993) find only weak support for the APT in Canada using proxies derived from factor analytic techniques and Otuteye (1991) finds somewhat stronger empirical support for models working with the macroeconomic factors. Kryzanoski and To (1983) find that the scree plot suggests two factors are able to explain the bulk of sector variation over 1962 to 1971. This study finds that factor analytic techniques are successful at identifying four factors using two data sets. The APT model constructed using four of the most correlated sectors provides sufficiently robust results. The findings of this study therefore differ from previous studies. The contents of the data sets, methodologies employed and sample periods used in this study do, however, vary to those of the literature.

It must be noted that the means of the results displayed in the tables refer to a market that is equally weighted in share participation. The proxies for single-index model are indices based on a market capitalisation weighting.

While it appears that both single and multi-index models are adequate for asset-pricing (given the mean p values $< 0.1\%$ for the total period), the choice of data set for further risk adjusted an analysis must be made. The multi-index model of both data sets are regressed against their respective market indices. The DataStream data set yields a R^2 of 0. 69 and a R^2 adjusted of 0.69. The S&P data set yields a R^2 of 0.76 and a R^2 adjusted 0.75. These results and those tabulated earlier suggest that the S&P data set should be used for asset-pricing.

5.5. Summary and conclusion

This chapter investigates the overall structure of the Canadian market using monthly total returns data of the DataStream International share indices and sub-indices over the period 31 January 1989 to 31 July 2005. The Toronto stock exchange is the 8th largest in the world and consists of a broad variety of securities.

Cluster and factor analysis on both S&P and DataStream International indices suggests that the sectors that explain most of the variation on the S&P TSX composite are: (1) Energy (Oil and natural gas), (2) Information Technology, (3) Mining, (4) Retailing, and (5) Engineering. These indices provide economic rationale to the behaviour of returns on the Toronto Stock Exchange.

The multifactor structure of the S&P TSX Composite Index returns is confirmed using scree plot eigenvalues under the extraction rule of Cattel and Jaspars (1967). For both S&P and DataStream International indices, four factors are extracted. The factors cumulatively explain 86% and 89% of the variation respectively.

APT model for both the S&P and DataStream International indices are constructed using the four indices most closely associated with each of the factors as proxies. A single-index model using the market index is also constructed.

In order to assess the asset models' ability to explain the time series variation, the single-index model is compared to the APT model. The APT models for both the S&P and DataStream International data sets prove to perform better as they display a higher average R^2 and adjusted R^2-adjusted values for more companies than the Single-index model. The APT models effectively explain significant amounts of variation among the residuals of the single-index model. Both in and out sample asset-pricing tests are also conducted to provide insight into the presence of non-stationarity. It appears that all the asset-pricing models lose explanatory power over time pointing to the possibility of non-stationarity.

The S&P model on the whole appears to provide marginally more explanatory power than the DataStream models. The S&P asset-pricing models are therefore carried forward to Chapters Six, Seven and Eight where it is applied in the risk adjustment procedures.

-6-

Univariate and Multivariate Cross-Sectional Style Analysis

6.1. Introduction

This chapter investigates the cross-sectional relationships between firm-specific attributes and share returns following the methodology of Fama and Macbeth (1973). Most of the literature discussed in Chapter three focuses on isolated anomalous attributes. This chapter aims to explore the potential anomalous nature of an exhaustive list of 904 attributes among the S&P TSX Composite Index equities using unadjusted and both CAPM and APT risk adjusted returns.

Univariate cross-sectional analysis is used to uncover the attributes that are able to explain total and non-systematic returns over the entire sample period. In and out sample tests are carried out to assess whether the attributes are sample specific or not.

Various performance measures are employed to evaluate the cross sectional regression results. These include correlation coefficients and Students t-statistic on the derived time series of coefficients (payoffs). Attributes are conceived to represent commonly identified investment styles such as value, growth and momentum. Cluster Analysis is performed on all attributes to reflect any style commonalities and groupings. Consistency tests are also conducted on the payoffs to determine which attributes provide the most consistent time series of payoffs.

Finally, a stepwise multivariate regression is undertaken using all the attributes shown to be significant in order to identify the group of style anomalies that best explain the returns structure of the shares that constitute the S&P TSX Composite index.

The remainder of the chapter is set out as follows: Section 6.2 discusses the data and methodology, Section 6.3 reports the results, and Section 6.4 summarises and concludes.

6.2. Data and Methodology

The winsorised monthly returns and attribute data for the 221 shares listed on the S&P TSX Composite index as described in Chapter 4 are used for the univariate tests. Data for the sample period 31 January 1989 to 31 December 2000 make up the *in* sample and data for the remaining period (31 January 2001 till 31 July 2005) make up the *out* sample. Both sample periods inherently suffer from the survivorship bias as the shares selected are drawn from the constituents of the S&P TSX Composite index as of 31 July 2005.

6.2.1. Returns

The Return Index (RI) supplied by DataStream International represents the total return of shares as it includes dividend information (dividends are reinvested to buy more shares) and controls for capital events such as stock splits, capitalisation issues and share dividends. Share returns for the month ending at time t are calculated as: $(RI_t - RI_{t-1}) / RI_{t-1}$. Outliers are adjusted using the winsorisation technique described in Chapter 4 in order to control for possible data errors and the effect of outliers on the regression results. The monthly return of any share is limited to 100%. Shares not yet listed during the sample period do not have data observations. Data points void of observations are not included in the analysis.

6.2.2. Attributes

The complete list of winsorised attributes listed in Appendix A.4 in Chapter 4 are all included in the monthly analyses as the independent variable. The monthly cross section of each attribute is standardised by subtracting the cross sectional mean and dividing by the cross sectional standard deviation. The standardisation procedure yields a cross sectional mean of zero and a standard deviation of one for every month for each attribute. This allows for the cross sectional regression coefficients to be compared with each other and used for further testing. The standardisation methodology follows that of van Rensburg and Robertson (2003). They show that the standardisation procedure does not significantly affect the regression slope coefficient's t-statistics. A confirmatory test using Students t-test is performed to compare standardised regression coefficients against non-standardized coefficients. The test shows that the t-statistic, is in almost all cases, not influenced by the standardisation procedure. Appendix C.2 displays the full results of the test.

Haugen and Baker (1996) replace missing attribute values with the mean attribute value for the month. For the purposes of this study, missing monthly data observations and their corresponding returns value (independent variable) are excluded from the data set.

The independent variables or attributes are grouped into different categories: value, growth, size, momentum, risk and liquidity based on subjective style interpretation. Due to the substantial amount of attributes employed in the analysis, groupings of only significant attributes are shown in the results.

6.2.3. Data limitations

A number of limitations or constructs inherent in data sets have notoriously biased results of statistical analysis regarding anomalies. The most noteworthy biases such as the survivorship, look ahead bias and data snooping are discussed and the precautionary actions to eradicate or minimise their effects are presented.

Survivorship bias

The survivorship bias theory suggests average returns in sample periods are misstated because only companies that have not de-listed as a result of bankruptcy or other are included in the sample. The average returns generated by data analysis are therefore likely to have an upward bias, as firms delisting due to financial distress would reduce the actual returns of the all-inclusive sample.

Chan, Jagadeesh and Lakoniskok (1995) find that shares removed from data sets are not often embroiled in financial distress and their removals are rather more frequently related to mergers, acquisitions and suspensions due to non-compliance with exchange regulations. They estimate that of the 9.6% of CRSP company years missing Compustat data for the period 1968 to 1992, only 3.1% relate to financial distress. They conclude that the survivorship bias is unlikely to affect anomaly persistence among returns.

Davis (1994) finds that the book-to-market, earnings yield and cash -flow to price anomalies still have explanatory power using a data set free of the survivorship bias for United States stocks over the 1940-1963 period. This implies the firm specific attributes still have a role to play within samples that contain equities that may not maintain their listings in the future.

The entire sample set used in this thesis is subject to the survivorship bias. Shares de-listed or removed from the S&P TSX Composite index between 31 January 1989 and 31 July 2005 are not included in the data set.

Look ahead bias

The look ahead bias relates to the use of accounting or other information as a predictor or explanatory variable when the information has already been incorporated into the dependent variable. The predictive power of the accounting information may thus appear highly significant. Berk (1995) finds that attributes using prices in their construction are *a priori* related to returns as price changes affect returns.

Conventional wisdom habitually expresses that markets tends to anticipate events. If this statement holds to be true, an attribute using price through its construction (for example the PE ratio) is likely to rise (fall) in anticipation of good (bad) news therefore distorting the ratio prior to the event. The question of within what time frame the market anticipate is able to anticipate the event needs to be attended to.

This thesis is not exposed to the look ahead bias for two reasons. Firstly, DataStream International's data is void of the look ahead bias as accounting information is provided only once it is publicly available. Secondly, the thesis follows the van Rensburg and Robertson (2003) methodology of regressing end of month returns with beginning of month attributes which is more likely to ensure that the data is publicly available. This lead time period of one month further negates or at least minimises the possibility of the market's ability to anticipate financial, technical or other information.

Data Snooping

Lo and Mckinlay (1995) contend that the use of an extremely large set of independent variables in the search of predictors of returns will inevitably produce spurious relationships. This in turn may improve the lifespan of some of these relationships until eventually they fail to work. Similarly, popular trading strategies developed through the optimisation of trading models often have exemplary historical records, but may not have any certainty of working in the present.

Lucas, van Dijk and Kloek (2001) using US data from 1984 to 1999 reveal that attribute's payoffs vary significantly over time. It is proposed that consistency of payoffs over time should be gauged before drawing conclusions on anomaly persistence.

Haugen and Baker (1996) find a multitude of style characteristics that are persistent across exchanges in five different countries. Payoffs of these factors have low correlations across the different countries inferring that style based approaches across countries tend to vary.

This thesis tests 904 firm specific attributes. The sheer size of sample attributes increases the probability of spurious relationships occurring. However, spurious attributes are likely to be identified or eliminated for the following reasons. The data set consists of in and out sample periods which allow for the comparison of significant attributes. The univariate tests aim to identify the presence of anomalous relationships for unadjusted returns, CAPM adjusted returns and APT adjusted returns. Exhaustive performance and consistency tests are carried out on significant attributes and are likely to uncover spurious elements. Furthermore, economic rationale is provided for most of the attributes.

6.2.4. Methodology

The cross sectional regression tests follow a similar methodology to that of Fama and Macbeth (1973) and van Rensburg and Robertson (2003). All attributes values are lagged by one month in order to conservatively avoid the look ahead bias. The monthly attribute values for each share are then regressed against a return value for each share. The cross sectional monthly regressions and the return values are discussed in detail in section 6.2.4.1 to 6.2.4.3. for the unadjusted, CAPM adjusted and APT adjusted tests.

All 904 attributes are tested using the unadjusted methodology discussed in Section 6.2.4.1. The coefficients of the 904 of attributes, of which some are highly correlated, are subjected to a correlation filter using the Pearson (1896) product moment correlation statistic (referred to as "correlation" for the remainder of the chapter) and is calculated as:

$$r_{j,k} = \frac{\sum_{t=1}^{n}(j_t - \bar{j})(k_t - \bar{k})}{\sqrt{\sum_{t=1}^{n}(j_t - \bar{j})^2 \sum_{t=1}^{n}(k_t - \bar{k})^2}} \tag{6.10}$$

Where j_t and k_t are the payoffs for any two characteristics in month t, $\bar{j}$ and $\bar{k}$ are the mean payoffs to those characteristics, and n is the number of months.

When two attributes that are highly correlated list (high correlation is defined as being greater than 0.8 or less than -0.8), the attribute with the higher Students t-statistic from the time series of monthly payoffs is kept and the attribute with the lower t-statistic is removed. Some 175 attributes of the 211 significant attributes are removed during the filtration process for the unadjusted sample. The correlation filter ensures that only the most significant attributes are preserved in the results.

The time series of slope coefficients and constants (alpha) from the cross sectional monthly regressions of the preserved attributes are presented and subjected to the performance measures discussed in table 6.1

6.2.4.1. Unadjusted tests

The unadjusted tests aim to explores the explanatory power of the individual attributes. Cross sectional regressions using Ordinary Least Squares (OLS) are performed for each month against the raw or unadjusted returns of the shares. The methodology follows that of Fama and Macbeth (1973) and van Rensburg and Robertson (2003). The regression takes the form:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1}A_t + \varepsilon_{i,t+1} \tag{6.1}$$

where:

$r_{i,t+1}$ = realized return on share i for month $t+1$

$\gamma_{0,t+1}$ = constant intercept term

$\gamma_{1,t+1}$ = cross-sectional slope coefficient estimated from the regression

A_t = standardised value of the attribute of the share at end of each month t

$\varepsilon_{i,t+1}$ = residual error

Each attribute at the beginning of a month is regressed against the shares' returns generated over that month. This helps to negate the look ahead bias.

A time series of slopes which represent the monthly payoffs are derived from the cross sectional regression of the dependent variable (returns) and the independent variable (attribute). Both the slope and the alpha coefficient from the regression generated for each month are likely to hold some predictive power for the raw return. The unadjusted tests are run for the total, in and out sample periods.

The mean slope coefficient over the sample period for each attribute is tested for significance using Student's t-test which takes the form:

$$t_1 = \frac{\bar{\gamma}_1 - 0}{\sigma_{\gamma 1} / \sqrt{n}}$$

6.2.4.2. Risk-adjusted returns: CAPM

The second test examines the ability of the attributes to explain the variation of returns after CAPM risk adjustment. Once again, the methodology follows that of van Rensburg and Robertson (2003). The CAPM model splits share returns into a risk-free factor (represented by a constant), a risk factor for taking on systematic risk (represented by a coefficient, Beta) and an unexplained factor (residual). The Beta coefficient measures the shares exposure to the systematic risk and the non-systematic risk element is assumed to be eliminated through diversification. The breakdown of the types of returns drawn from the CAPM model is shown below.

$$r_{i,t} = r_{f,t} + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

Here $r_{i,t}$ and $r_{m,t}$ are the realised returns on share i and the market proxy for month t respectively. The $r_{f,t}$ term represents the risk-free rate and β_i is the covariance between r_i and r_m divided by the variance of r_m . The $\varepsilon_{i,t}$ term represents a random error term.

The purpose of the risk adjusted CAPM returns test is to extract the characteristics which still persist after risk adjustment and thus are not proxies for systematic risk. The risk adjusted return for each share is extracted from the model using the following procedure.

A time series regression for each share is performed using market premium (market proxy's return minus the risk-free rate) and the share's returns adjusted for the risk-free return. The market proxy used is the S&P TSX Composite index and three month Bankers Acceptance Rate comprises the risk-free rate. This Ordinary Least Squares (OLS) regression for each share is specified as follows:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \tag{6.2}$$

The constant α_i, refers to a part of the return either greater or lower than the return predicted by the CAPM. If the CAPM were to hold, the constant term would be zero and the error term $\varepsilon_{i,t}$, would be normally distributed. The excess return, used as the independent variable in equation 6.2. is now split into the risk factor coefficient β_i and a portion of return unexplained by the CAPM model namely: $\alpha_i + \varepsilon_{i,t}$.

The univariate regressions are now conducted to assess the attributes' explanatory power of these unexplained (risk adjusted) returns in a cross sectional form:

$$(\alpha_i + \varepsilon_{i,t+1}) = \gamma_{0,t+1} + \gamma_{1,t+1}A_t + e_{i,t+1}$$

The constant α_i and error term $\varepsilon_{i,t+1}$ is estimated from the time-series regressions, The constant $\gamma_{0,t+1}$ and error term $e_{i,t+1}$ are values generated in the univariate cross sectional regression. The value $\gamma_{1,t+1}$ is the coefficient of attribute value A_t. The means of the resulting time-series of slope coefficients are again tested for significance using Students t-test. The risk adjusted CAPM tests are run for total, in and out sample periods.

6.2.4.3. Risk-adjusted returns: APT

The third univariate test examines the explanatory power of the attributes after APT risk adjustments. The APT model, similar to the CAPM, segregates share returns into three sources: the risk-free rate, systematic risk (represented by the coefficients of the factors of the APT model) and the error term:

As with the CAPM adjustment, a time-series regression for each share is run over the period 31 January 1989 to 31 July 2005 and takes the form:

$$\begin{aligned} r_{i,t} = r_{f,t} + \beta_{factor1,i}(r_{factor1,t} - r_{f,t}) + \beta_{factor2,i}(r_{factor2,t} - r_{f,t}) + \ldots \\ + \beta_{factor4,i}(r_{factor4,t} - r_{f,t}) + \varepsilon_{i,t} \end{aligned} \tag{6.3}$$

The $r_{i,t}$ and $r_{f,t}$ terms again represent the realised share return for share i and the risk-free rate respectively. The $r_{factor,t}$ terms are the returns of Factors one to four for the period t. The APT proxies, as derived in Chapter Five, include the total returns of the following S&P indices: (1) Energy; (2) IT; (3) Metals & Minerals; and (4) Retailing. The Canadian three month Bankers Acceptance rate is again used as the risk-free rate. The $\beta_{factor,i}$ terms indicate the relationship between the variation of share return and that of the factor's return.

As with the CAPM model, the ordinary least squares regressions are conducted for all shares returns less the risk-free return against the excess returns of the APT factors. Both the constant and error terms represent the return unexplained by the APT model and are used in the univariate tests following the CAPM risk adjusted returns methodology:

$$(\alpha_i + \varepsilon_{i,t+1}) = \gamma_{0,t+1} + \gamma_{1,t+1} A_t + e_{i,t+1} \tag{6.4}$$

Again, $\varepsilon_{i,t+1}$ is estimated from the time-series regressions, while $e_{i,t+1}$ is the residual error from this regression. The means of the resulting time-series of slope coefficients are again tested for significance.

Any evidence of unrelenting anomalous characteristics should be found in the CAPM and APT univariate tests as they eliminate systematic risk. The case for style based effects is further strengthened if attributes are found to be significant in all three returns samples. APT risk adjusted tests are conducted for the total, in and out sample periods.

6.2.4.4. Performance Measures for the cross sectional tests

The t-statistics for the slopes of the characteristics derived using unadjusted returns are visually comparable to those derived using risk adjustment with CAPM and APT models. The correlation coefficient between attributes and returns, and the mean payoffs calculated in the tests are also included. The performance measures are summarised in table 6.1.

Table 6.1. Summary of Performance Measures

Descriptions of performance measurement criteria used for all three cross sectional regression tests

Performance Measure	Description	Underlying Formula
Student's t-test	Student's t-test is conducted to test whether the time series monthly coefficients are different from zero.	$t_1 = \frac{\bar{\gamma}_1 - 0}{\sigma_{\gamma 1} / \sqrt{n}}$ where $\bar{\gamma}_1$ is the mean of the time series of monthly coefficients from the cross sectional regression, $\sigma_{\gamma 1}$ is the standard deviation and n is the number of observations.
Correlation Coefficient	The monthly cross sectional correlation between the attribute's return and the total return is measured. The correlation statistic used is the Pearson (1896) product moment correlation statistic.	$r_{j,k} = \frac{\sum_{t=1}^{n}(j_t - \bar{j})(k_t - \bar{k})}{\sqrt{\sum_{t=1}^{n}(j_t - \bar{j})^2 \sum_{t=1}^{n}(k_t - \bar{k})^2}}$

Cluster Analysis

The monthly payoffs of the significant characteristics are clustered applying Ward's Method (see Chapter 5.1.3.1) enabling divisions between any significant attributes to be observed. Ward's method uses an analysis of variance (ANOVA) approach to evaluate the distances between clusters. This approach attempts to minimize the sum of squares of any two clusters that can be formed at each step. Cluster analysis is conducted on the payoffs for the total, in and out sample for the unadjusted sample and is presented in a tree diagram format with style grouping labels.

Style Consistency

The consistency of the monthly payoffs' direction is evaluated using four measures: (1) the percentage of times the payoff is positive (negative); (2) the frequency of the payoff change expressed as a percentage over total number of months; (3) the Binomial sign test that tests whether the payoffs follow a binomial distribution with p= 0.5; and (4) the Wilcoxon signed rank test that tests whether the sample median is different from zero. Measures (3) and (4) are both non-parametric tests and are therefore not constrained by the normal distribution assumption set out in the Students t-statistic.

The probability associated with the number of positive and negative payoffs observed is calculated using the non-parametric Binomial Sign test. The null hypothesis states that the payoffs follow a binomial distribution with p= 0.5. The Binomial sign test is conducted to test whether the probability (one in which only two outcomes are possible) of the sample proportion above and below the true median should be one-half. The test relies solely on the direction (and not the size) of the payoffs. The probability mass function is given by:

$$P(c) = \binom{N}{c} 0.5^{c}(1-0.5)^{N-c} \tag{6.5}$$

where

$\binom{N}{c}$ represents $\dfrac{N!}{c!(N-c)!}$

where N is the total number of months and c is the number of positive (negative) payoff months. The null is rejected if the cumulative probability associated with the number of positive (negative) payoffs is greater than $(1-p)$ where p is the level of significance. The null hypothesis is rejected at the 5% significance level.

The Wilcoxon Rank signed test computes the absolute value of the difference between each observation and the median, and then ranks the observations from high to low.

The Wilcoxon test, which does not account the payoff size, is based on the idea that the sum of the ranks for the samples above and below the median should be similar.

6.2.4.5. Multivariate cross-sectional Regression

A multivariate model is constructed to evaluate which groups of the univariately significant attributes are able to explain the time series of returns most concisely. The multifactor model is created by cross-sectionally regressing the most significant characteristic (added in order of significance) on the one monthly forward returns. A second most significant attribute is added, and once again a multivariate regression including the two independent variables is carried out. The monthly regression is of the form:

$$r_{i,t+1} = \gamma_{0,t+1} + \gamma_{1,t+1}A_{1,t} + \gamma_{2,t+1}A_{2,t} + \varepsilon_{i,t+1}$$

where $A_{1,t}$ and $A_{2,t}$ are the two standardised candidate attributes for period t, $\gamma_{1,t+1}$ and $\gamma_{2,t+1}$ represent the respective cross-sectional coefficients, and $r_{i,t+1}$ the realised return on share i for month $t+1$. The $\gamma_{0,t+1}$ and $\varepsilon_{i,t+1}$ represent, the constant intercept term and the residual error respectively.

Two measures are employed to extrapolate the core attributes and eliminate redundant ones. The measures include Student's t-test of the slope coefficients and the adjusted R squared value.

The mean values of the time-series of cross-sectional slope coefficients $\gamma_{1,t+1}$ and $\gamma_{2,t+1}$ are subjected to Student's t-test to identify whether the attributes' slopes are significantly different from zero. Attributes with slopes found to be insignificant at the 10% level are removed from the regression. The adjusted R squared of the regression is compared each time attributes are added to assess the goodness of fit. The adjusted R squared also reduces the impact of added attributes that can overestimate the regression. Newly added attributes that lower the adjusted R squared are consequently dropped from the model.

The stepwise multivariate regression model continues to add and drop attributes until the list of significant attributes is exhausted. The multivariate cross sectional regression tests are conducted on the unadjusted, CAPM risk adjusted and APT risk adjusted samples.

6.3. Results

6.3.1. Univariate cross sectional tests

The results of the univariate cross-sectional regressions for the unadjusted and risk adjusted tests are displayed in Tables 6.2 and Appendix C.6 and C.7 respectively. For each attribute, the style grouping and the mean of the time series slope are displayed along with the corresponding t-statistic. The correlation coefficient discussed in table 6.1 is also presented. Attributes are ordered in descending order of the absolute values of the t-statistics.

Several popular attributes that have often been associated with excess returns have been included in the lower boxes (highlighted and in italics) of the tables 6.2 and appendices C.6 and C.7. These attributes include: price to earnings ratio (PE), dividend yield (DY), price to sales ratio (PSALES), Price to cash per share (PCASHPS), book to market value (BTMV), six month change in earnings per share (EPS_6M), twelve month change in earnings per share (EPS_12M), six month momentum (RI_6M), twelve month momentum (RI_12M) eighteen month momentum (RI_18M) and twenty four month momentum (RI_24M).

In almost all cases, with the exception of RI_18M and BTMV, these attributes are found to be either insignificant or highly correlated with other attributes. They have been presented for comparability and discussions regarding findings obtained from previous empirical studies relating to Canadian anomalies.

Table 6.2. Significant Attributes: Unadjusted Returns

Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed and give rise to a time series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attributes, the grouping, mean monthly payoff (coefficient), and correlation between attributes and unadjusted returns for each attribute that is significant at the 5% level using Student's (1908) t-test. Attributes are ranked in descending order of their absolute value of the t-statistics. The italicized and highlighted attributes are for comparison purposes and are discussed in Section 6.1.5. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	Grouping	T statistic	Mean Payoff	Correlation
P	Size	**-7.44**	-0.009	-0.06
LNCAPS	Size	**-6.37**	-0.009	-0.08
NTAV_18M	Growth	**6.35**	0.007	0.07
PNAV_12M	Value	**6.11**	0.008	0.08
EPS	Size	**-5.19**	-0.004	-0.04
POUT	Growth	**-5.08**	-0.005	-0.04
NTAV_24M	Value	**5.06**	0.006	0.06
LNMV	Size	**-4.80**	-0.009	-0.05
P_12M	Momentum	**4.49**	0.008	0.06
VO_3M	Liquidity	**4.38**	0.006	0.04
MV	Size	**-4.26**	-0.004	-0.02
TV_3M	Liquidity	**3.89**	0.003	0.03
PNAV_18M	Value	**3.69**	0.005	0.06
PSALES_6M	Value	**3.63**	0.005	0.06
CASHPS	Size	**-3.24**	-0.016	-0.04
INTCOVER_BT	Risk	**3.00**	0.002	0.03
PSALES_3M	Value	**3.00**	0.004	0.05
PNAV_6M	Value	**2.95**	0.005	0.05
BTMV_18M	Value	**2.80**	0.004	0.03
LCPS	Size	**-2.78**	-0.017	-0.04
DEBTNTAV	Risk	**-2.73**	-0.002	-0.02
TV_1M	Liquidity	**2.66**	0.002	0.02
RI_15M	Momentum	**2.44**	0.004	0.04
TLCTA	Risk	**-2.39**	-0.002	-0.02
EPS_3M	Growth	**2.39**	0.002	0.02
NPBT_18M	Growth	**2.32**	0.002	0.02
PTCA	Value	**2.28**	0.003	0.03
P_6M	Momentum	**2.22**	0.004	0.04
BTMV	Value	**2.18**	0.006	0.03
CFOPS	Size	**-2.11**	-0.005	-0.02
DPS_12M	Growth	**2.08**	0.002	0.03
BORROW_RATIO	Risk	**-2.07**	-0.002	-0.01
DPS_18M	Growth	**2.03**	0.002	0.03
STCL	Risk	-1.99	-0.002	-0.01
RI_12M	*Momentum*	**4.26**	*0.007*	*0.06*
RI_18M	*Momentum*	**2.43**	*0.004*	*0.04*
RI_6M	*Momentum*	**2.08**	*0.004*	*0.04*
RI_24M	*Momentum*	*1.94*	*0.003*	*0.03*
PCASHPS	*Value*	*1.40*	*0.001*	*0.02*
EPS_12m	*Growth*	*1.30*	*0.001*	*0.01*
EPS_6m	*Growth*	*1.29*	*0.001*	*0.01*
PSALES	*Value*	*1.24*	*0.002*	*0.01*
DY	*Value*	*1.22*	*0.001*	*0.01*
PE	*Value*	*-0.48*	*-0.001*	*-0.01*

The cross sectional regression analysis yields thirty-four, nineteen and nineteen significant uncorrelated attributes for the unadjusted, CAPM risk adjusted and APT risk adjusted returns respectively. The number of attributes that statistically generate anomalous returns declines after taking into account systematic risk. The most prominent style effects are, in order of significance, size followed by value, growth, risk, momentum and liquidity.

The attributes in tables 6.2 and Appendices C.6 and C.7 have been ranked in descending order in terms of their absolute t value. The order of significance among attributes is also ranked according to their absolute mean beta return divided by their standard deviation. This ratio, similar to the Sharpe ratio (expected return minus risk-free returns divided by standard deviation), shows the 'reward per unit of risk' of bearing exposure to an attribute. The ranking of attributes according to this ratio did not differ from the ranking according to absolute t value. This infers that the order of the lists represent an order of 'best candidates' for excess return generation. Note that attributes with negative mean betas and t-statistics are indicative of an inverse relationship with returns. All size related anomalies retain such relationships.

Discussion on previous findings

The lower boxes on tables 6.2 and Appendix C.6 and C.7 provide a list of italicized common attributes that have frequently been tested in empirical studies and been argued to exhibit abnormal return generating ability. Whilst practically all of these attributes are not found to be significant in this study, they are worthy of discussion due to the plethora of prior research. The methodologies used in the studies mostly incorporate portfolio sorting and ranking techniques. Most of the methodologies employed in the literature differ from the cross sectional tests and therefore may not be comparable to those mentioned below and in the literature review of Chapter Three.

Cleary (1998) uses a portfolio of shares ranked by one years momentum with a double weighting on the prior three months to test the profitability of momentum strategies. He finds that the top performing momentum portfolio continues to outperform lower portfolios over the 13 year period of the study. The top portfolio returns have greater

Sharpe and Treynor ratios than the Market portfolio and lower momentum portfolio's. The findings of this study confirm the presence of momentum before systematic risk adjustement. Six, twelve and eighteen month momentum are found to be significant for unadjusted returns tests. After risk adjustment however, no momentum measures are significant. Cleary concludes that momentum strategies on the Toronto stock exchange may be exploitable for nimble traders with low costs. The results tabled above agree with Cleary's findings on an unadjusted returns basis, but suggest that after risk adjustment, excess returns are unlikely to be generated through exposure to momentum.

Bourgeois and Lussier (1994), Bartholdy (1998) and Jog and Li (1995) find low PE shares exhibit significant outperformance. Bourgeois and Lussier (1994) sample data falls outside the sample period of this study. Elfakhani and Bishara (1991) document little support for an independent PE effect. This study agrees with Elfakhani and Bishara as the PE ratio is not a significant attribute for both unadjusted and risk adjusted samples between 1989 and 2005.

Susmaga, Michalowski and Slowinski (1997), Elfakhani, Lockwood and Zaher (1998), Kortas, L'her and Plante (2004) and Jog and Li (1995) find the market to book ratio (inverse of book to market ratio) to exhibit explanatory power to abnormal returns over different sample periods. The findings of this study confirm the significance of the book to market ratio (BTMV) and the 18 month change in the ratio (BTMV_18M) for unadjusted returns. Only the BTMV_18M remains significant after risk adjustments

Susmaga, Michalowski and Slowinski (1997) finds quarterly earnings changes (EPS_3M) as a significant attribute in explaining abnormal returns from 1989-1993. This study agrees with these findings for the period of 1989 and 2005 for unadjusted, CAPM risk adjusted, but not APT risk adjusted returns. Six month (EPS_6M) and twelve month (EPS_12M) changes in earnings are not found to be significant either. Susmaga et al also document the price to sales (PSALES) ratio as a significant attribute. This study's PSALES results are in contrast to Susmaga et al.

Filbeck and Visser (2003) explore dividend yield strategies on the top 30 Canadian shares over 1987-1997. Highest dividend yielding shares are found to outperform others. This study does not find dividend yield (DY) to be a significant attribute.

Table 6.3 presents the final list of the attributes found to be significant for unadjusted, CAPM risk adjusted and APT risk adjusted returns. Figure 6.1 presents a tree cluster diagram of the unadjusted monthly payoffs.

Table 6.3. Significant Attributes Summary: Unadjusted and Risk Adjusted Returns

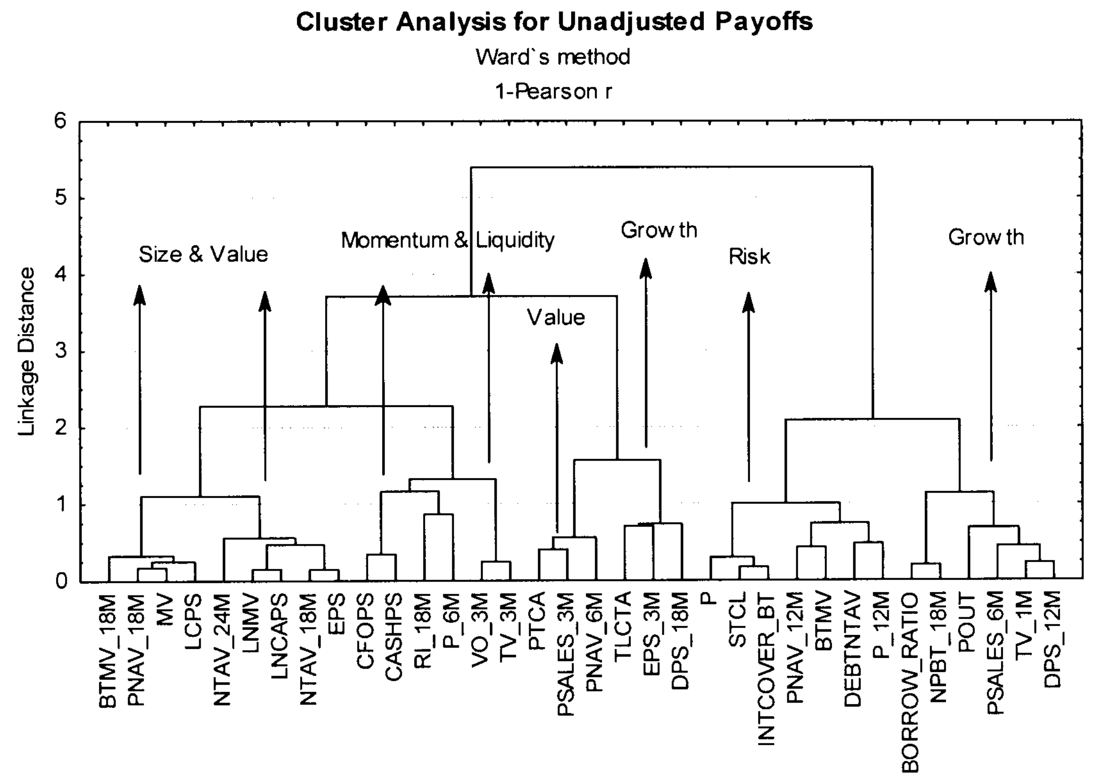
The table displays the name, attribute grouping and t-statistics for both standardised unadjusted and risk adjusted attributes found significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their style groupings in descending order of the absolute value of the t-statistics for the unadjusted returns. The values in bold display the significant attributes. This summary serves as the final list of all significant uncorrelated attributes. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Name	Grouping	Unadjusted t-statistic	CAPM t-statistic	APT t-statistic
PNAV_12M	Price to Net asset value [1 year change]	Value	**6.08**	**3.31**	**2.52**
PNAV_18M	Price to Net asset value [18 Month change]	Value	**3.87**	1.73	1.50
PSALES_6M	Price to sales [6 Month change]	Value	**3.63**	1.16	0.80
PSALES_3M	Price to sales [3 Month change]	Value	**3.00**	**2.05**	1.62
PNAV_6M	Price to Net asset value [6 Month change]	Value	**2.94**	0.25	0.69
BTMV_18M	Book to market value [18 Month change]	Value	**2.80**	**3.26**	**3.18**
PNTAV	Price to Net tangible asset value	Value	**-2.66**	**-2.18**	-1.45
PTCA	Price to current assets	Value	**2.28**	1.63	**2.01**
BTMV	Book to market value	Value	**2.18**	1.37	1.32
PCASHPS	Price to cash per share	Value	1.40	1.32	0.55
P	Price	Size	**-7.44**	**-6.19**	**-5.94**
LNCAPS	Natural log current assets per share	Size	**-6.37**	**-6.24**	**-6.89**
EPS	Earnings per share	Size	**-5.19**	**-4.91**	**-5.75**
LNMV	Natural log Market value	Size	**-4.80**	**-4.27**	**-3.98**
MV	Market Value	Size	**-4.26**	**-5.56**	**-5.37**
CASHPS	Cash per share	Size	**-3.24**	**-2.50**	**-2.58**
LCPS	Loan capital per share	Size	**-2.78**	**-2.85**	**-2.75**
CFOPS	Cash flow from operations per share	Size	**-2.11**	**-2.35**	**-2.83**
INTCOVER_BT	Interest cover before tax	Risk	**3.00**	1.76	1.90
DEBTNTAV	Debt to net tangible asset value	Risk	**-2.73**	**-2.76**	-1.73
TLCTA	Loan capital to assets	Risk	**-2.39**	-1.76	**-2.09**
BORROW_RATIO	Borrowing ratio	Risk	**-2.07**	-1.91	-1.77
STCL	Borrowing ratio	Risk	**-1.99**	-1.92	**-2.16**
TDTTA	Total debt to Total assets	Risk	-1.65	-1.88	**-2.50**
STTD	Sales to total debt	Risk	1.59	1.13	**3.03**
P_12M	Price [1 year change]	Momentum	**4.47**	1.35	0.77
P_18M	Price [18 Month change]	Momentum	**2.56**	0.35	0.21
P_6M	Price [6 Month change]	Momentum	**2.22**	-0.06	-0.28
VO_3M	Absolute trading volume [3 Month change]	Liquidity	**4.38**	**3.69**	**3.81**
TV_3M	Trading volume ratio [3 Month change]	Liquidity	**3.89**	**4.13**	**4.23**
TV_1M	Trading volume ratio change 1M	Liquidity	**2.66**	**3.21**	**3.50**
TV	Trading volume ratio	Liquidity	1.36	1.18	**2.15**
NTAV_24M	Net Tangible Asset Value [2 Year change]	Growth	**5.02**	**4.45**	**3.07**
NTAV_18M	Net Tangible Asset Value [18 Month chang	Growth	**6.28**	**5.11**	**3.58**
POUT	Payout ratio	Growth	**-5.08**	**-5.29**	**-4.93**
EPS_3m	Earnings per share [3 Month change]	Growth	**2.39**	**2.00**	1.67
NPBT_18M	Net profit before tax [18 Month change]	Growth	**2.32**	1.89	1.60
DPS_12M	Dividend per share [1 year change]	Growth	**2.08**	**2.55**	**2.16**
DPS_18M	Dividend per share [18 Month change]	Growth	**2.02**	**2.17**	1.72

6.3.2. Cluster Analysis

Figure 6.1. Tree Diagram of Clusters of Monthly Payoffs: Unadjusted Returns

The vertical tree diagram showing the hierarchical cluster analysis of monthly coefficients to standardised firm-specific attributes as calculated from univariate cross-sectional regressions on unadjusted total monthly returns data over the period January 1989 to July 2005. Only attributes with an average of monthly coefficients significant at the 5% level in a Student's (1908) t-test are included. The data were extracted from DataStream International, available at the University of Cape Town. Ward's method is used for clustering. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



The significant attributes for the total sample period, 31 January 1989 to 31 July 2005, have been grouped according to size, liquidity, growth, momentum, value and risk. The cluster analysis in figure 6.1 displays the commonalities among attributes within these style groupings. While not all style attributes form their own individual cluster, many display a common type of variation and form smaller clusters of the same grouping. The clustering of sales to current liabilities (STCL), interest cover before tax (INTCOVER_BT) and debt to net tangible asset value (DEBTNTAV) for example show common linkages within the "risk" grouping. Similarly, the natural log of market value (LNMV), earnings per share (EPS) and natural log of current assets per share (LNCAPS) are size attributes that cluster together.

The cluster analysis diagrams of the in and out sample periods for the unadjusted and risk adjusted returns are displayed in Appendices C.2. to C.5. The style attribute groupings are more visually apparent for the risk adjusted payoffs.

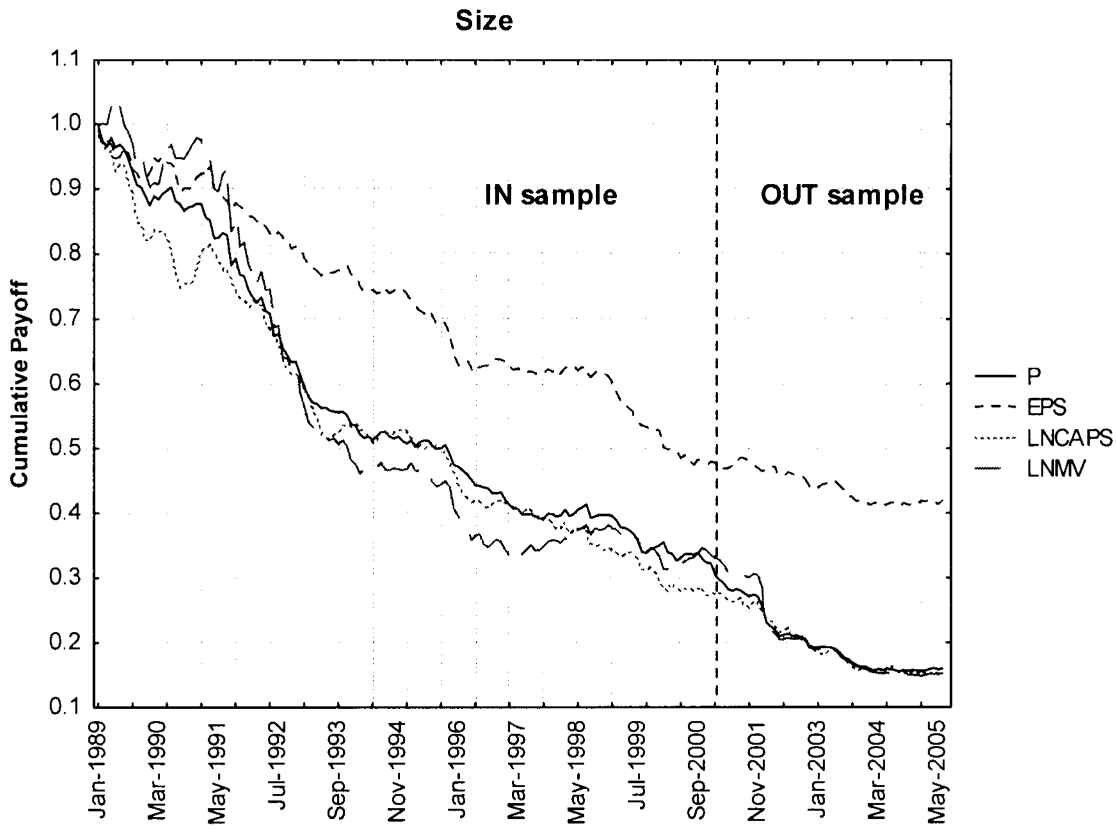
6.3.3. Style Attribute Discussion

Figures 6.2 to 6.7 display the cumulative monthly payoffs over the total sample period, 31 January 1989 to 31 July 2005, for the most significant attributes of the six styles identified. The cross sectional monthly regressions coefficients are derived from regression analysis that assumes an equally weighted market portfolio. Similarly, the cumulative monthly payoffs displayed are subject to this assumption. The cumulative payoffs represent 'extra' return generated from holding exposure to a specific attribute. The final cumulative payoff at the end of the period represents the dollar increase that the attribute generated. For example the book to market's (BTMV) final cumulative payoff is 2.97. This suggests that $1 worth of exposure to BTMV would have resulted a 297% return over the 31 January 1989 to 31 July 2005 period.

Some of the attributes (for example, any 'size' related attributes such as market value) exhibit cumulative payoffs that tend to zero. This suggests that market value and all other size effects display an inverse relationship to returns and surmises that small companies are likely to produce higher risk adjusted returns than larger companies.

Figure 6.2. Cumulative Monthly Payoffs: Size

The cumulative monthly payoffs of the attributes that fall into the Size style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.



Size Effect attributes			
Attribute	Unadjusted T statistic	CAPM T statistic	APT T statistic
P	-7.44	-6.19	-5.94
LNCAPS	-6.37	-6.24	-6.89
EPS	-5.19	-4.91	-5.75
LNMV	-4.80	-4.27	-3.98
MV	-4.26	-5.56	-5.37
CASHPS	-3.24	-2.50	-2.58
LCPS	-2.78	-2.85	-2.75
CFOPS	-2.11	-2.35	-2.83

Price (P), natural log of market value (LNMV) and natural log of current assets per share are the most obvious size effects in Figure 6.2 All size characteristics show an inverse relationship and are found to be significant for the unadjusted and risk adjusted tests.

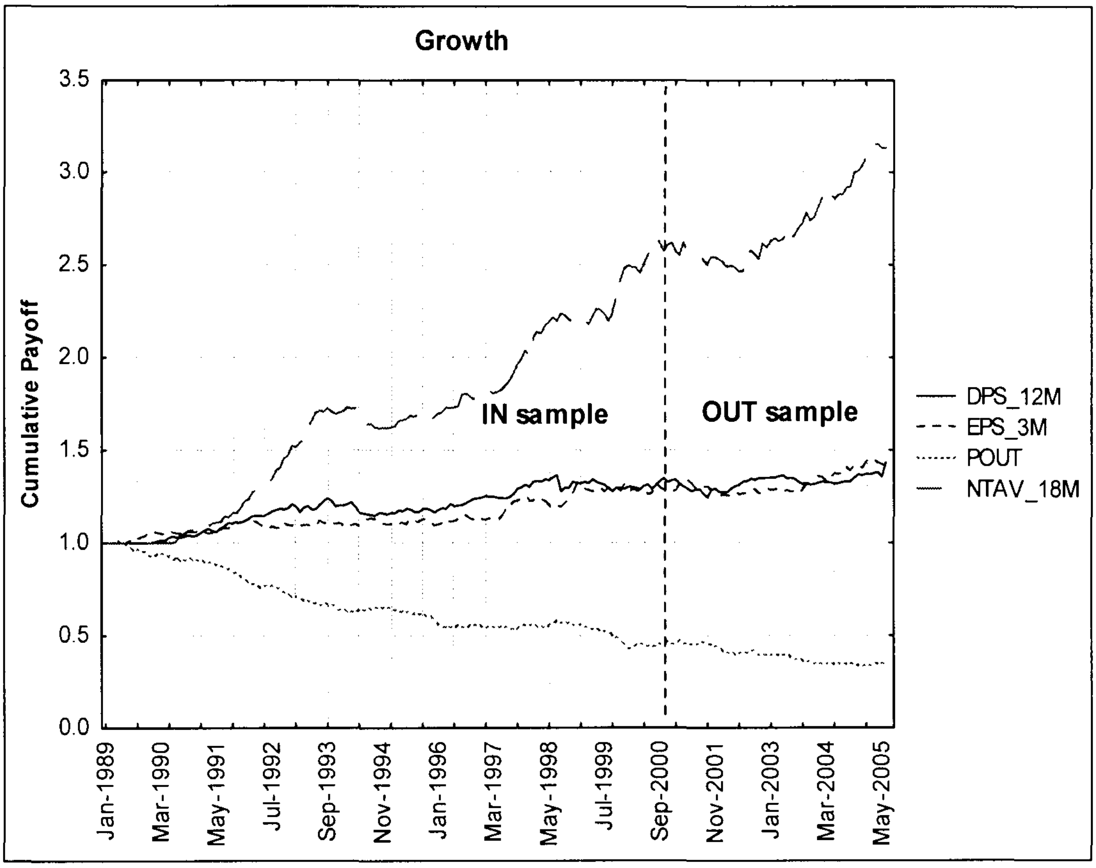
The findings support those of Foerster and Porter (1992), Fowler, Rorke and Jog (1980), Jog and Riding (1986), L'Her, Masmoudi and Suret (2002), Assoé (2004), Susmaga, Michalowski and Slowinski (1997) and Jog and Li (1995). All the above mentioned studies use market value (MV) as a size proxy with only the latter using both MV and P.

Price (P) itself is not necessarily related to size as it is purely a measure of market value divided by shares in issue. Low priced shares, by virtue of mathematical construction, experience greater return changes when prices fluctuate and hence the much touted attraction (repulsion) of penny stock investing. Low priced shares are however common among smaller firms rather than their higher priced and more established counterparts. It is therefore important to consider the size and mathematical elements that are both likely to contribute to the return component.

Similarly, the LNCAPS, EPS, CASHPS, LCPS and CFOPS attributes are constructions derived from accounting values and number of shares in issue. While they may not be directly be related to size, companies that display low values for these attributes tend to be smaller and vice versa. The attributes' clear inverse relationships to returns suggest that they are similar to other size attributes. For the purpose of this paper, they have been selected as size attributes, although caution should be exercised in their interpretation.

Figure 6.3. Cumulative Monthly Payoffs: Growth

The cumulative monthly payoffs of the attributes that fall into the Growth style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.



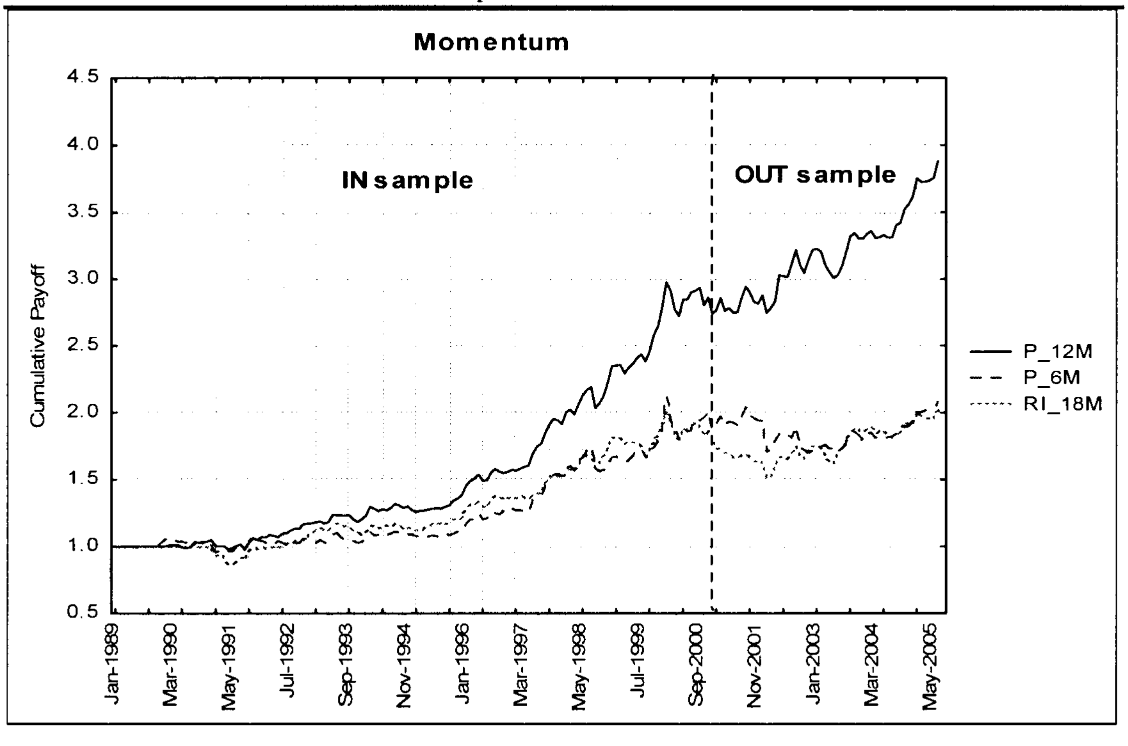
Growth Effect attributes			
Attribute	Unadjusted T statistic	CAPM T statistic	APT T statistic
NTAV_24M	5.02	4.45	3.07
NTAV_18M	6.28	5.11	3.58
POUT	-5.08	-5.29	-4.93
EPS_3m	2.39	2.00	1.67
NPBT_18M	2.32	1.89	1.60
DPS_12M	2.08	2.55	2.16
DPS_18M	2.02	2.17	1.72

The Growth attributes presented in figure 6.3 include the changes in dividends (DPS_12M and DPS_18M) and changes in earnings per share (EPS_3M). The twenty four and eighteen month change in net tangible asset value (NTAV_24M) reflects changes in the actual assets of the company. The payout ratio (POUT) is inversely related, as companies with low dividend payout ratios (reinvesting profits) are likely to have higher growth rates as they have more profitable projects to pursue. Companies with high yearly (and 18 month) dividend increases also appear to generate excess returns, and are somewhat in contradiction to the low dividend anomaly argument.

The findings are supportive of Susmaga, Michalowski and Slowinski (1997), who document quarterly earnings changes (EPS_3M) as a significant attribute in explaining abnormal returns using a sample period of 1989 to 1993 for Canadian equities.

Figure 6.4. Cumulative Monthly Payoffs: Momentum

The cumulative monthly payoffs of the attributes that fall into the Momentum style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.



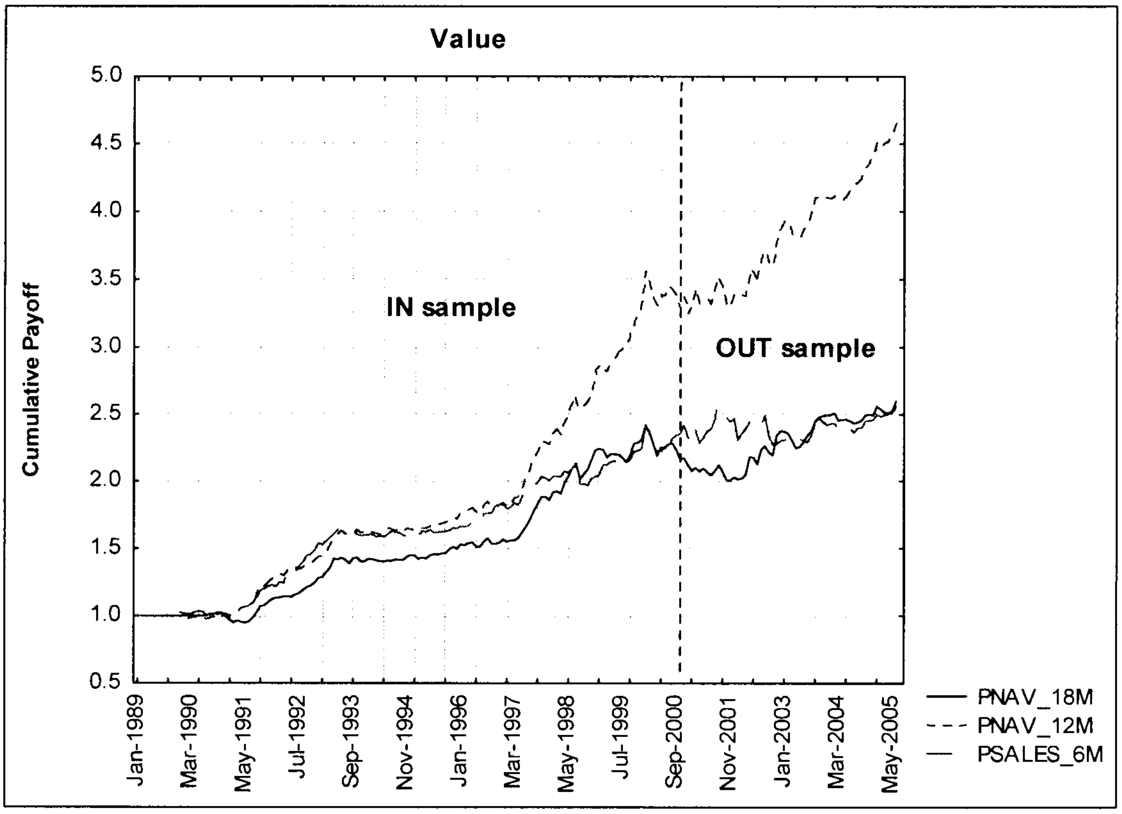
Momentum Effect attributes			
Attribute	Unadjusted T statistic	CAPM T statistic	APT T statistic
P_12M	**4.47**	1.35	0.77
P_18M	**2.56**	0.35	0.21
P_6M	**2.22**	-0.06	-0.28

The significant momentum attributes among the unadjusted returns sample include price change over twelve months (P12_M), price change over six months and the total return change over eighteen months (RI_18M). The price change over twelve months is the most significant attribute and produces the highest cumulative payoff. None of these characteristics are significant after risk adjustment.

While this study focuses only on monthly evidence, it does to some extent corroborate the findings of Kryzanowski and Zhang (1992) who note that winner portfolios ranked by momentum continue to outperform on a one to two year period. L'Her, Masmoudi and Suret (2002), Cleary (1998), Susmaga, Michalowski and Slowinski (1997), Kortas, L'her, and Plante (2004) and Foerster, Prihar and Schmidt (1994) document similar findings. The results in this thesis are in contrast to Assoé (2004) who finds monthly loser portfolios significantly outperform winner portfolios for the 1963 to 1998 period.

Figure 6.5. Cumulative Monthly Payoffs: Value

The cumulative monthly payoffs of the attributes that fall into the Value style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.



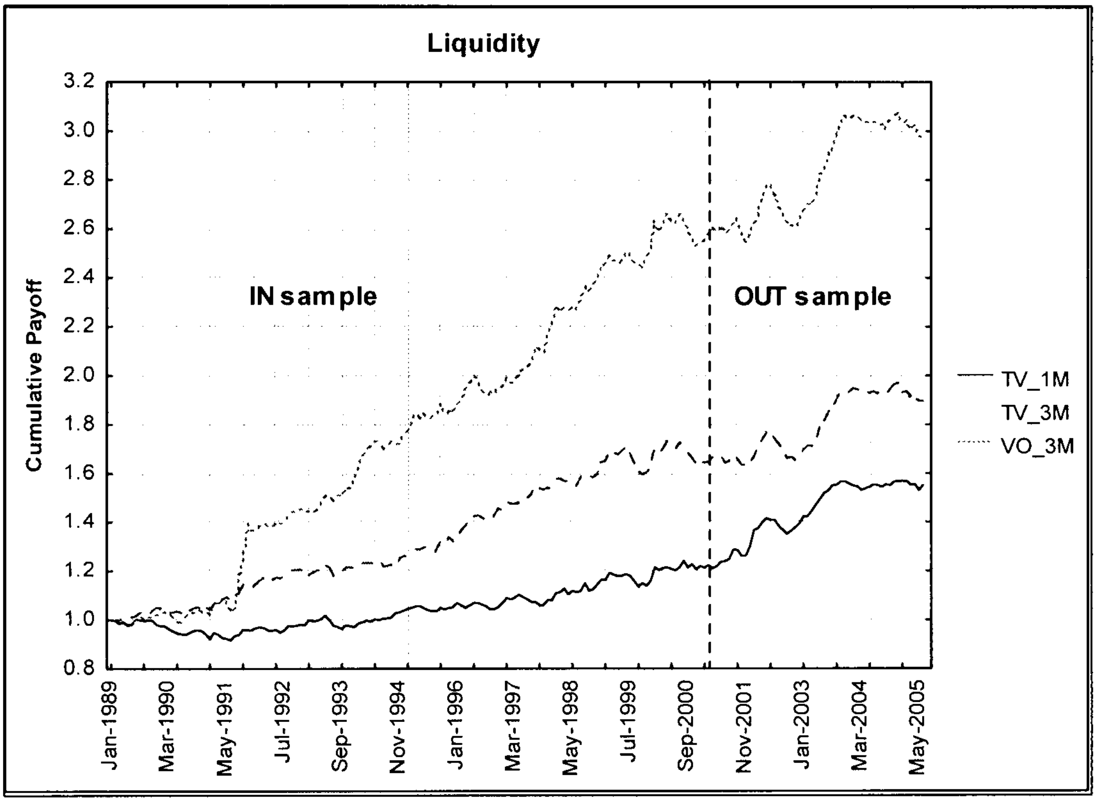
Value Effect attributes			
Attribute	**Unadjusted T statistic**	**CAPM T statistic**	**APT T statistic**
PNAV_12M	**6.08**	**3.31**	**2.52**
PNAV_18M	**3.87**	1.73	1.50
PSALES_6M	**3.63**	1.16	0.80
PSALES_3M	**3.00**	**2.05**	1.62
PNAV_6M	**2.94**	0.25	0.69
BTMV_18M	**2.80**	**3.26**	**3.18**
PNTAV	**-2.66**	**-2.18**	-1.45
PTCA	**2.28**	1.63	**2.01**
BTMV	**2.18**	1.37	1.32
PCASHPS	1.40	1.32	0.55

The twelve month change in price to net tangible asset value (PTNAV_12M) is the most significant attribute of the value group with the highest t-statistic and cumulative payoff of 465% over the entire period. The value effect candidates shown in Figure 6.5 appear to display remarkable consistency and appear to be stronger than the other style based effects.

Susmaga, Michalowski and Slowinski (1997) find the price to sales ratio have explanatory power of abnormal returns while Jog and Li (1995) do not. This study only finds the six month change in the price to sales ratio (PSALES_6M) to be significant for unadjusted returns.

Figure 6.6. Cumulative Monthly Payoffs: Liquidity

The cumulative monthly payoffs of the attributes that fall into the Liquidity style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.

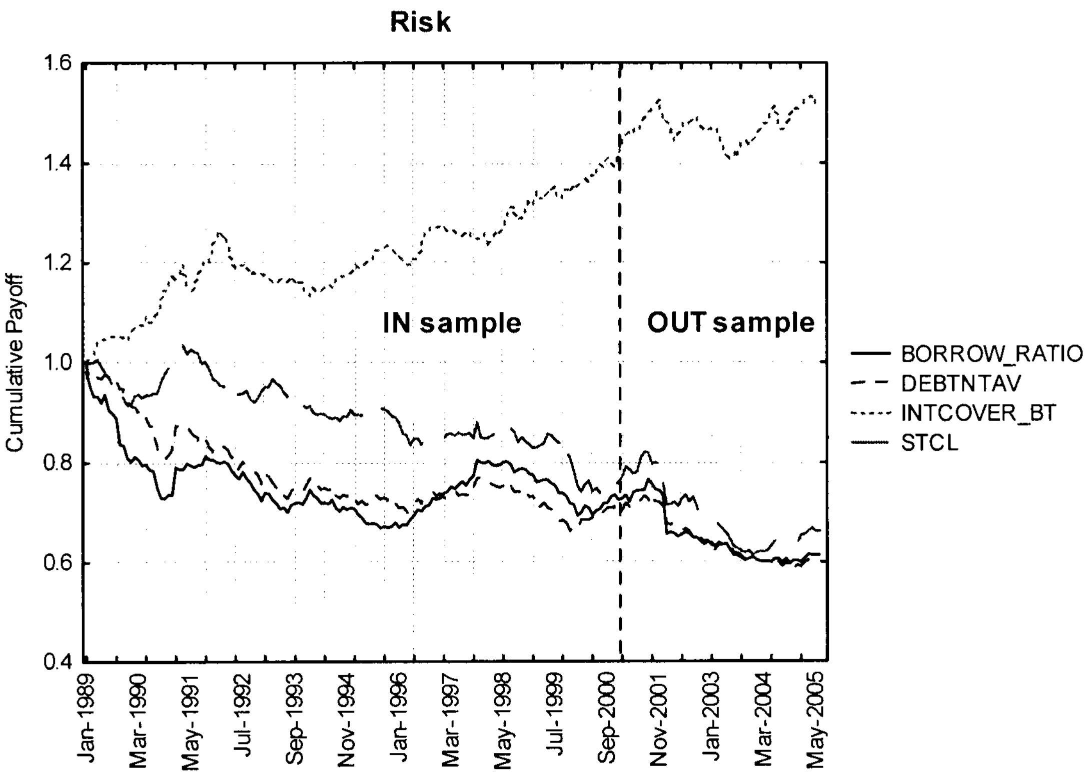


Liquidity Effect attributes			
Attribute	**Unadjusted T statistic**	**CAPM T statistic**	**APT T statistic**
VO_3M	**4.38**	**3.69**	**3.81**
TV_3M	**3.89**	**4.13**	**4.23**
TV_1M	**2.66**	**3.21**	**3.50**
TV	1.36	1.18	**2.15**

Short term changes in the trading volume ratio (TV_1M and TV_3M) and the three month change in the absolute volume ratio (VO_3M) are found to be significant. Visually, the attributes do not appear to be consistent. Trading volumes usually rise in bull markets (much of the 1990's) and decline during bear markets (as can be witnessed during from 2000-2003). The volume measures seem to portray aspects of both growth and size affects as firm's volumes increase as they become larger and attract more institutional ownership.

Figure 6.7. Cumulative Monthly Payoffs: Risk

The cumulative monthly payoffs of the attributes that fall into the Risk style group. In and out sample periods are labelled on the charts. The monthly payoffs are obtained from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. The graphs start at the value 1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. A table of the inclusive attributes is presented below the chart.



Risk Effect attributes			
Attribute	**Unadjusted T statistic**	**CAPM T statistic**	**APT T statistic**
INTCOVER_BT	**3.00**	1.76	1.90
DEBTNTAV	**-2.73**	**-2.76**	-1.73
TLCTA	**-2.39**	-1.76	**-2.09**
BORROW_RATIO	**-2.07**	-1.91	-1.77
STCL	**-1.99**	-1.92	**-2.16**
TDTTA	-1.65	-1.88	**-2.50**
STTD	1.59	1.13	**3.03**

The risk factors include interest cover before tax (INTCOVER_BT), debt to net tangible assets (DEBTNTAV), the borrowing ratio (BORROW_RATIO) or debt to equity ratio, and sales to current liabilities (STCL). The inverse attributes suggest that companies holding less debt tend to generate higher excess returns. The interest cover ratio's cumulative payoffs are positively related to returns as the market appears to value companies more that can readily finance their interest payments. This is particularly noticeable during bear market periods. The risk factors are less significant than the other style attributes and arguably more volatile in nature

In and out sample periods

The in and out sample period tests are carried out to compare the stationarity of the characteristics. Both unadjusted and risk adjusted results are presented in Appendices C.8 to C.14. The in sample period (31 January 1989 to 31 December 2000) displays some 43 attributes as opposed to the 11 attributes of the out sample period (January 2000 to July 2005). The in sample period shows a large number of size, growth and value styled attributes. The size and value style appear to dominate the other styles types throughout the out sample period.

It can be argued that the disparate results can be attributed to the different sizes of the sample periods. It is also possible that some of the factors lose significance over time as the anomalies are subject to exploitation, abating their persistence. The latter suggestion is seemingly less likely as the most obvious (and most recognizable) anomalous attributes such as P, PTNAV_12, LNMV and EPS remain highly significant even during the out sample period. The inconsistency between the two sample periods does raise questions to why many of the anomalies are not recurrent or whether they are perhaps perennial in nature. Non-stationary or perennially style based effects over time casts doubt over their exploitability. The noticeable trends discussed above are also consistent among the risk adjusted and sample specific tests.

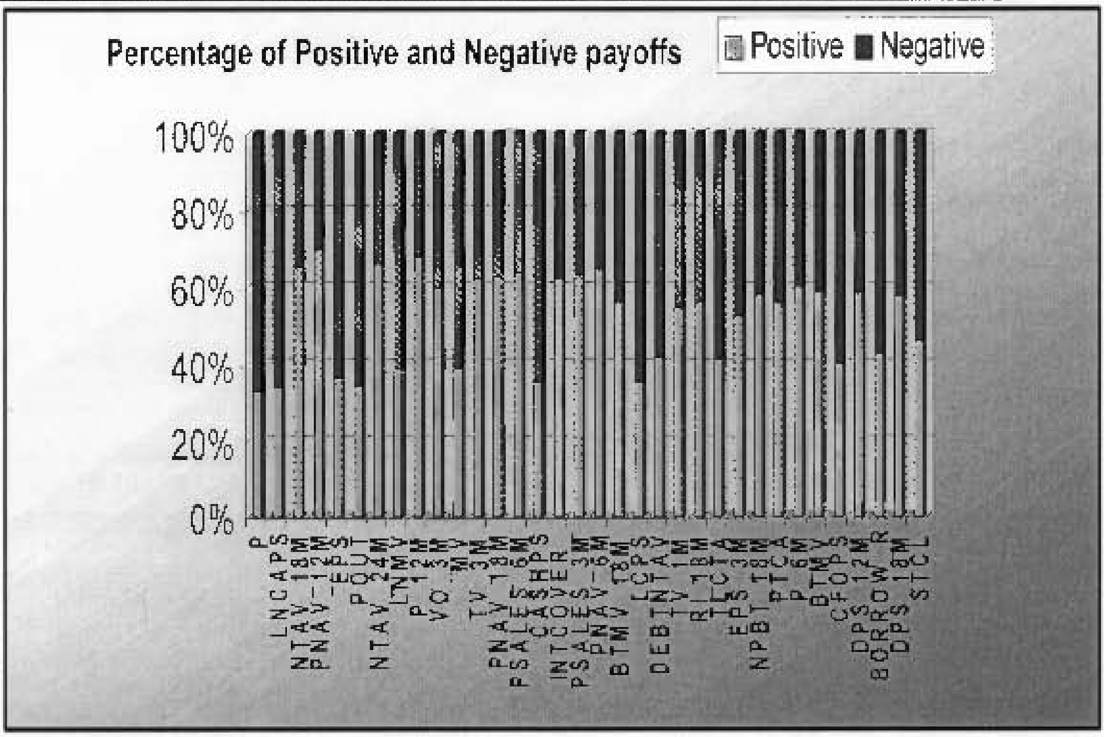
6.3.4. Style consistency

Figure 6.8 provides a picture of each characteristic's consistency by representing the number of positive or negative payoffs as a percentage of the total payoffs. Regular positive or negative payoffs indicate the relationship between attributes and returns. Frequent payoff direction (either positive or negative) shows relationship consistency and a better the likelihood of generating abnormal returns. Note that consistency tests merely consider direction and not the quantity of the payoff.

The percentage of the number of times the payoff is negative is shown by the dark bars while the light bars represent the ratio of the number of times the payoff is positive. Inverse attributes e.g. P, show more frequent negative payoffs than positively related attributes such as BTMV. Appendix C.16 charts the frequency of the changes in payoffs as a percentage of the total payoffs.

Figure 6.8. Consistency of the Direction of Monthly Payoffs

The light bars on the chart show the percentage of times the monthly payoffs are positive while the light bars show the percentage of times the payoffs are negative. The monthly payoffs are the monthly coefficients from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



The size, risk attributes (excluding INTCOVER_BT) and POUT display inverse payoff direction while the remainder of the attributes show positive direction. The most consistent attributes include: P, LNCAPS, NTAV_18M, PNAV_12M, EPS, POUT, NTAV_24M, LNMV, P_12M, PNAV_6M, MV, LCPS, CASHPS and PSALES_6M. The size and value effects therefore have the appearance of being the most consistent.

The attributes showing the least amount of sign changes over the sample period are practically those mentioned above. This set of the most consistent attributes concurs with the list of attributes found to be most significant in the cross sectional tests.

The Binomial sign and the Wilcoxon rank signed tests show that only the three month change in earnings (EPS_3M), trading volume ratio (TV) and sales to current liabilities (STCL) are likely to have a median equal to zero. For the remainder of the attributes, the null hypothesis can be rejected at a 5% level confirming style consistency. The results of these two tests are displayed in appendix C.15 for unadjusted and risk adjusted attributes. The percentage of positive (negative) payoffs and the frequency charts for the in and out sample appear in appendices C.17 to C.20.

6.3.5. Multivariate Cross sectional Regression

Table 6.4. Results of Multivariate Cross-Sectional Regressions

Multivariate cross-sectional regressions of the significant standardised univariate attributes on unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed The multivariate regressions start with the most significant univariate attribute, and thereafter attributes are added in the regressions (in order of univariate significance). The time series of independent variables' slopes are subjected to a t-test (using Student's (1908) t-test at the 10% level) and the adjusted r squared of the regression is also taken. Variables are removed if the time series of slopes are not significant or if the attribute does not improve the adjusted r squared value. The procedure produces a multifactor model in which the attributes, as independent variables, are univariately and multivariately significant. The results of the regression, as conducted in E-Views is shown below. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Dependent Variable: RAWRETURN
Method: Least Squares
Date: 01/10/07 Time: 18:32
Sample (adjusted): 5305 43752
Included observations: 15218 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.019591	0.000908	21.57044	0.0000
P	-0.007256	0.001228	-5.907372	0.0000
LNCAPS	-0.006828	0.001279	-5.340192	0.0000
PNAV_12M	0.009111	0.00102	8.930331	0.0000
EPS	0.004463	0.001268	3.521281	0.0004
NTAV_24M	0.005869	0.000912	6.433686	0.0000
BTMV	0.0088	0.001277	6.892177	0.0000

R-squared	**0.018636**	Mean dependent var	0.015557
Adjusted R-squared	0.018249	S.D. dependent var	0.102789
S.E. of regression	0.101847	Akaike info criterion	-1.730226
Sum squared resid	157.7815	Schwarz criterion	**-1.726717**
Log likelihood	13172.29	F-statistic	48.14201
Durbin-Watson stat	1.665486	Prob(F-statistic)	0

The regression results for the unadjusted sample are tabulated above.

The multivariate regression conducted for the unadjusted sample shows an adjusted R squared of 0.0186 . The following attributes are found to be significant independent variables: Price (P), natural log of current assets per share (LNCAPS), twelve month change in price to net asset value (PNAV_12M), earnings per share (EPS), twenty four month change in net tangible asset value (NTAV_24M) and book to market value (BTMV).

The CAPM risk adjusted sample yields an adjusted R squared of 0.0081 and finds the following significant attributes: Price (P), Payout ratio (POUT), eighteen month change in net tangible asset value (NTAV_18M), one month change in trading volume (TV_1M) and twenty four month change in borrowings (BORR_REPAY_24).

Similarly, the APT risk adjusted sample yields an adjusted R squared of 0.04 and finds the following significant attributes: natural log of current assets per share (LNCAPS), Payout ratio (POUT), one month change in trading volume (TV_1M), twelve month change in price to net asset value (PNAV_12M) and twelve month change in dividends per share (DPS_12M).

The results of the CAPM and APT regressions are tabled in appendices C.22 and C.23.

The regressions suggest that size effects (P, LNCAPS and EPS) and value effects (BTMV, NTAV_24M, NTAV_18M and PNAV_12M) dominate the independent variables. The growth (POUT and DPS_12M) and liquidity (TV_1M) effects are less prominent. The adjusted R squared values show considerable decline after taking into account systematic risk, which implies that the anomalies become less persistent after factoring in the appropriate market proxies. The multivariate regression results do confirm that the most prominent attributes as measured by the univariate t-statistics, correlations and consistency collectively provide a somewhat account of return generation.

6.4. Summary

This chapter explores which key firm specific attributes exhibit explanatory power over a cross sectional returns data set of companies that make up the S&P TSX Composite index. The exploration is carried out for all listed companies in the total sample period (31 January 1989 - 31 July 2005), in sample (31 January 1989 - 31 December 2000) and out sample period (January 2000 - 31 July 2005). The one month forward share price returns of 221 companies are regressed on some 904 attributes. Implementing the methodology of Fama and Macbeth (1973), the derived time series regression coefficients are tested for significance using Students t test. A multivariate cross sectional regression analysis is also conducted. All cross sectional regressions are conducted using unadjusted, CAPM risk adjusted and APT risk adjusted returns.

The coefficients of the 904 of attributes, of which some are highly correlated, are subjected a correlation filter using the Pearson (1896) product moment correlation statistic. A final list of significant attributes is derived and classified according to six style interpretation groups, namely: (1) size, (2) liquidity, (3) growth, (4) momentum, (5) value and (6) risk. Cluster analysis performed on attribute payoffs finds some commonality in how the various style based effects group together.

Performance measures for the significant attributes include Students t-test of the time series of the cross sectional coefficients and the correlation between attributes and returns. Attributes are also ranked according to their mean beta divided by the standard deviation of the betas to present a reward to risk ratio for attribute exposure. The results find that 'size effect' and 'value effect' attributes continue to be significant in total, in and out sample periods. This in consistent with most Canadian literature that is orientated around anomaly exploration. *In* and *out* sample tests reveal that few common anomalies are recurrent in both periods and brings into question their exploitability. Some of the attributes previously found to be associated with abnormal returns such as price to sales, price to earnings, book to market, momentum and earnings momentum ratios are found to be either insignificant or less significant after risk adjusted returns are tested.

Cumulative payoffs of attributes within the style groups are displayed to show the positive or negative relationship of attributes over the total sample period. The final cumulative payoff amount shows the dollar amount earned for holding exposure to a specific attribute. The payoffs generally follow a consistent direction but do exhibit periods where the payoff's direction appears to reverse. This raises doubt as to whether exposure to a styled attribute is exploitable or whether its direction is predictable.

Style consistency tests are conducted on the payoffs to determine which attributes provide the most consistent time series of payoffs. Median tests are also conducted on the payoffs to determine if the medians of the payoffs are different from zero. The most significant attributes identified by the univariate studies are found to exhibit greater style consistency.

The univariate analysis is somewhat limited in it's assessment of finding attributes that generate abnormal returns. A univariate framework fails to consider the other firm specific attributes that occur concurrently. This is especially the case for less significant attributes. Multivariate cross sectional regression analysis suggests the persistence of size and value effects within all unadjusted and risk adjusted samples. The analysis implies that unadjusted and risk adjusted returns are best explained by attributes such as P, LNCAPS, PNTAV_12M, NTAV_18M, TV_1M and POUT. These attributes appear to have the best combined ability to produce abnormal returns.

The sample size period of almost 17 years may not be enough to fully understand the consistency of attribute performance. The reduction of significant attributes within the out sample group casts doubt to the stationarity and consistency of the anomalous attributes. Finally, the survivorship bias cannot be ignored. The context of survivorship must be considered in light of numerous size effects amongst the findings that may be construed as proxies for illiquidity and bankruptcy.

This chapter uncovers a number of attributes that are associated with abnormal returns among the shares that constitute the S&P TSX Composite Index. These attributes and their corresponding payoffs are used for further testing and manipulation in Chapters seven and eight.

-7-

Style Timing

7.1. Introduction

This chapter assesses the nature of the time series of attributes' payoffs derived in Chapter Six and the ability to forecast future payoffs. The style consistency tests conducted in Chapter Six show great variability among the direction of the time series of coefficients from the univariate cross sectional regressions. The significance of the final attributes derived in the previous chapter imply that abnormal returns are obtainable through exposure to those attributes, but are somewhat hindered by the variation and inconsistencies of the payoffs. The aim of this chapter is thus to determine whether the performance of the significant characteristics can be improved through the use of a style timing model which predicts monthly payoffs.

The payoffs of the significant attributes for both unadjusted and risk adjusted tests are first tested for autocorrelation by examining the relationship of each payoff series with its own lagged payoffs. The same series are also tested for stationarity by establishing whether a unit root exists. Six style timing models are then created and their ability to forecast payoffs is measured using the following performance criteria: (1) the correlation between the forecast payoffs and the actual payoffs; (2) the percentage of times the payoff direction is correctly forecast to total forecasts (tested for probability using the nonparametric Sign Test); (3) the absolute value of the alpha and the beta coefficients obtained from the regression between forecasted and actual payoffs, and (4) Theil's (1958) Inequality Coefficient (referred to as "U-statistic" for the remainder of the chapter).

The remainder of the chapter is set out as follows: Section 7.2 provides an overview of the data and methodology, Section 7.3 reports the results, and Section 7.4 summarises and concludes.

7.2. Data and methodology

7.2.1. Autocorrelation and stationarity tests

The total data set consists of approximately 198 monthly payoffs (depending on any monthly changes) to the final significant attributes of the unadjusted and risk adjusted tests for the period 31 January 1989 to 31 July 2005 as calculated in Chapter Six.

Autocorrelation is tested using the following three methods. (1) A twelve-lag correlogram is calculated for each style characteristic and shows the autocorrelations between style's monthly payoffs and the twelve lags of those payoffs. Twelve lags are used to capture any possibility of monthly seasonal affects within the data set.

The autocorrelation T_k of each attribute's monthly payoffs at lag k is estimated by the following equation:

$$T_k = \frac{\sum_{t=k+1}^{N}(Y_t - \bar{Y})(Y_{t-k} - \bar{Y})}{\sum_{t=1}^{N}(Y_t - \bar{Y})^2}$$

where Y_t is the observed payoff in month t, $\bar{Y}$ is the sample mean, and N is the number of monthly payoffs. The calculation bears much similarity to Pearson's (1892) correlation coefficient and provides the correlation coefficient for values of the monthly payoff series that are k months apart. A nonzero T_1 value denotes serial autocorrelation for the first order.

(2) Partial-autocorrelations for lag k are given by the regression coefficient on Y_{t-k} calculated when Y_t is regressed on a constant, $Y_{t-1},\ldots Y_{t-k}$. The correlation from the intervening lags is removed to yield a partial-correlation that measures the correlation for values of the monthly payoff series that are k periods apart. If the pattern of autocorrelation can be captured by an autoregression of order less than k, the partial autocorrelation at lag k will be close to zero. Once again, twelve lags are utilized.

Both autocorrelations and partial-autocorrelations, for lags k = 1 to 12, are subjected to Student's t-test with the following the test-statistic:

$$\rho_{obs} = \rho_k \cdot \sqrt{\frac{T-2}{1-\rho_k^2}},$$

where *T-2* represents the degrees of freedom and *T* is the number of comparisons being made (months).

(3) Ljung-Box (1978) Q-statistics are employed to test the null hypothesis that no autocorrelation exists for up to k lags. The Q-statistic at lag k is calculated as follows:

$$Q_{obs} = T(T+2)\sum_{j=1}^{k} \frac{\rho_j^2}{T-J}$$

where τ_j is the j-th autocorrelation, T is the number of months and k is the maximum number of lags included in the test. Q_{obs} is asymptotically distributed using a chi-squared (χ^2) distribution with k degrees of freedom. The twelve lags are also maintained for the Q statistics tests.

All time series of slopes (payoffs) of style based attributes are tested for the presence of a unit root using the Augmented Dickey-Fuller (ADF) test. A unit root presence suggests that the time series is non-stationary. The ADF tests are performed as confirmation of stationarity within the time series. Failure thereof would invalidate the style timing models. The ADF test consists of running a regression of the first difference of the series against the series lagged once. The null hypothesis is that a unit root exists and indicates that the series of payoffs is non-stationery. For each attribute payoff (y_{it}), ADF tests that the β coefficients in the equation below are not significantly different from zero:

$$\Delta y_{it} = \alpha_{i0} + \beta_{i0} y_{it-1} + \sum_{v=1}^{V} b_{iv} \Delta y_{it-v} + \varepsilon_{it} \quad \text{where } \varepsilon_{it} \sim \text{IID}(0,\sigma^2)$$

The inclusion of a constant term (α_{i0}) allows for a random walk where the mean is not zero, and no time trend is included in the ADF test equation. The Dickey-Fuller test rejects the null hypothesis if the value of the t-statistic for each β coefficient lies to the left of the Mackinnone critical value, (H_0 : $\beta_0 = 0$). The number of lagged difference terms is set at 12. This should be sufficient to account for any present serial autocorrelation and to withstand the possibility of seasonality among payoffs.

7.2.2. Style Timing Models

The six style timing techniques employed to forecast future payoffs are summarised in table 7.1 below.

Table 7.1. Summary of Monthly Payoff Style-timing Models

The table displays the models constructed to forecast the monthly payoffs of the standardised firm-specific attributes. The actual monthly payoffs are derived from univariate cross-sectional regressions on unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The number of forecasts made by the models is dependent on the model type as well as the number of payoffs in each time series. The data were extracted from DataStream International, available at the University of Cape Town.

Model Type	Description
1M Model	One-month Moving Average Model Forecast is equal to the previous month's payoff
6M Model	Six-month Moving Average Model Forecast is equal to the six month trailing moving average
12M Model	Twelve-month Moving Average Model Forecast is equal to the twelve month trailing moving average
18M Model	Eighteen-month Moving Average Model Forecast is equal to the eighteen month trailing moving average
Mean Model	Historic Mean Model Forecast is equal to the trailing historic mean estimated retrospectively using an expanding window
AR12 Model	Twelve lag Autoregressive model Forecast is made using the regression equation consisting of a constant term and the first 12 lagged style payoffs. Coefficients of the model are estimated retrospectively using an expanding window.

Six timing models are created. The first uses the previous-month's payoff (1M) as an estimate of the next month's payoff. The model implies that future payoffs follow a random walk where the best estimate of a value is the most recent available value.

The next three models are constructed with trailing moving averages that forecast the following month's payoff. The first uses the six-month moving average (6M), the second uses the twelve-month moving average (12M), and the third uses the eighteen-month moving average (18M). The fifth model incorporates a trailing historic mean as an estimate of the next month's payoff. The mean is calculated on all payoffs prior to the month being forecast.

The final model is an autoregressive model that uses twelve lags (AR12). For each month, intercept and lag coefficients for the lagged variables are calculated from running the autoregression on the payoffs before that month. The forecast for that month is made using the regression equation estimated from the past months. The data set of payoffs increases as time progresses, enabling more forecasts, and is thus aptly termed an "expanding window" procedure. It is arguably a better method than using the entire sample, which would expose the tests to the look-ahead bias. The model is expected to improve its accuracy over time. For each attribute, the 12 lag autoregression equation (labeled AR12), is estimated as follows,

$$y_{it} = \alpha_t + \sum_{k=1}^{12} \beta_{ik} y_{it-k} + \varepsilon_{it}$$

where:

$y_{est,t}$ = the estimated payoff in month t

α_t = the intercept from the autoregression on the sample unique to month t

$\beta_{t,k}$ = the slope of the lagged monthly payoff from the auto-regression on the sample unique to month t

y_{t-k} = the actual payoff for month $t - k$

ε_{it} = the error term

Performance Measures for the style timing models

Table 7.2. Summary of Performance Measures

Descriptions of performance measurement criteria used for evaluating the style timing models.

Performance Measure	**Description**	**Underlying Formula**
Correlation Coefficient	Correlation between the attribute's forecasted and actual payoffs The t-test is conducted to test the correlations for significance.	$r_{j,k} = \frac{\sum_{t=1}^{n}(j_t - \bar{j})(k_t - \bar{k})}{\sqrt{\sum_{t=1}^{n}(j_t - \bar{j})^2 \sum_{t=1}^{n}(k_t - \bar{k})^2}}$ $\rho_{obs} = \rho_k \cdot \sqrt{\frac{T-2}{1-\rho_k^2}}$ with *T-2* degrees of freedom
Nonparametric sign test	The nonparametric Sign Test is used to test the null hypothesis that the models predict the correct sign less than 50% of the time.	$P(c) = \binom{N}{c} 0.5^c (1-0.5)^{N-c}$ where $\binom{N}{c} = \frac{N!}{c!(N-c)!}$
Sum of absolute value of the t-statistics of the intercept and beta coefficients	A regression between the actual payoffs and the forecasted payoffs is conducted. The t-statistics of the resulting intercept and beta coefficient of this regression are calculated and summed.	$\sum \lvert t_B \rvert + \lvert t_a \rvert$ Where $\lvert t_B \rvert$ is the absolute value of the slope coefficient t- statistic and $\lvert t_a \rvert$ is the absolute value of the intercept coefficient t- statistic.
Theil's (1958) Inequality Coefficient (referred to as "*U* - statistic")		$U = \frac{\sqrt{\sum_{t=1}^{h}(\hat{y}_t - y_t)^2 / h}}{\sqrt{\sum_{t=1}^{h}\hat{y}_t^2 / h} + \sqrt{\sum_{t=1}^{h} y_t^2 / h}}$ where $\hat{y}$ and y represent forecast and realised payoffs at time t and h represents the number of forecasts made.

The forecasting power of the six timing models is evaluated using four criteria: (1) the correlation between the forecast payoffs and the actual payoffs; (2) the percentage of times the payoff direction is correctly forecast to total forecasts (tested for probability using the nonparametric Sign Test); (3) the absolute value of the alpha and the beta coefficients obtained from the regression between forecasted and actual payoffs, and (4) Theil's (1958) Inequality Coefficient (referred to as " U -statistic" for the remainder of the chapter). Table 7.2 above provides the summary of these criteria.

The correlation between actual and forecasted payoffs is similar to the Information Coefficient (IC) of Grinold (1989) which tests the correlation between forecasts and realized share returns. The significance of the correlations is assessed using the t-test displayed in table 7.2. Positive correlations indicate a working model while negative correlations imply the opposite.

The non-parametric sign tests are the same as those used in Chapter 6 and test the null hypothesis that the models predict the correct sign less than 50% of the time.
The sign test gauges the strength of direction predictability and does not consider payoff magnitudes when the direction predictions are either correct or incorrect.
Models may therefore still hold predictive value, even if the null hypothesis is accepted. This occurs if the magnitudes of the payoffs are large enough to outweigh the volatility of direction in the time series of payoffs.

Further forecasting evaluation is conducted using the Theil's Inequality Coefficient (referred to as " U -statistic"). Its specification is as follows:

$$U = \frac{\sqrt{\sum_{t=1}^{h} (\hat{y}_t - y_t)^2 / h}}{\sqrt{\sum_{t=1}^{h} \hat{y}_t^{\,2} / h} + \sqrt{\sum_{t=1}^{h} y_t^{\,2} / h}}$$

7.3. Results

Table 7.3. Attributes used in the Style Timing Tests

The following attributes are used throughout the analyses conducted in this chapter. The table includes the name of each attribute and its corresponding Style grouping. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Name	Grouping
P	Price	Size
LNCAPS	Natural log current assets per share	Size
NTAV_18M	Net Tangible Asset Value [18 Month change]	Growth
PNAV_12M	Price to Net asset value [1 year change]	Value
EPS	Earnings per share	Size
POUT	Payout ratio	Growth
NTAV_24M	Net Tangible Asset Value [2 Year change]	Growth
LNMV	Natural log Market value	Size
P_12M	Price [1 year change]	Momentum
VO_3M	Absolute trading volume [3 Month change]	Liquidity
MV	Market Value	Size
TV_3M	Trading volume ratio [3 Month change]	Liquidity
PNAV_18M	Price to Net asset value [18 Month change]	Value
PSALES_6M	Price to sales [6 Month change]	Value
CASHPS	Cash per share	Size
INTCOVER_BT	Interest cover before tax	Risk
PSALES_3M	Price to sales [3 Month change]	Value
PNAV_6M	Price to Net asset value [6 Month change]	Value
BTMV_18M	Book to market value [18 Month change]	Value
LCPS	Loan capital per share	Size
DEBTNTAV	Debt to net tangible asset value	Risk
TV_1M	Trading volume ratio change 1M	Liquidity
PNTAV	Price to Net tangible asset value	Value
P_18M	Price [18 Month change]	Momentum
TLCTA	Loan capital to assets	Risk
EPS_3m	Earnings per share [3 Month change]	Growth
NPBT_18M	Net profit before tax [18 Month change]	Growth
PTCA	Price to current assets	Value
P_6M	Price [6 Month change]	Momentum
BTMV	Book to market value	Value
CFOPS	Cash flow from operations per share	Size
DPS_12M	Dividend per share [1 year change]	Growth
BORROW_RATIO	Borrowing ratio	Risk
DPS_18M	Dividend per share [18 Month change]	Growth
STCL	Borrowing ratio	Risk
TDTTA	Total debt to Total assets	Risk
STTD	Sales to total debt	Risk
PCASHPS	Price to cash per share	Value
TV	Trading volume ratio	Liquidity

Table 7.3 above displays the names, descriptions and style groupings of the significant attributes used in the style timing tests in this chapter.

7.3.1. Autocorrelation and stationarity tests

The t-statistics from the autocorrelations and partial-autocorrelations for each time series of payoffs for the unadjusted sample are presented in Table 7.4 to Table 7.5 respectively. The comparable results for the same tests on the time series of payoffs from the CAPM risk adjusted and APT risk adjusted returns are displayed in appendices D.1 to D.4. The LB Q-statistics p-values are shown in Appendices D.5 to D.7. The results from the Augmented Dickey-Fuller unit root tests are presented in appendices D.8.

Table 7.4. Autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the autocorrelations of the monthly payoffs to attributes are displayed. T statistics significant at the 5% level are highlighted and shown in bold. Significant t statistics reject the null hypothesis: The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross-sectional regressions on standardised standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.0010	.00	11.00	12.00
P	**2.44**	1.44	0.45	0.55	-1.21	0.55	-0.29	1.81	0.87	0.86	**2.02**	1.48
LNCAPS	1.69-1.79		0.17	0.73	-1.00	1.72	0.77	0.71-0	13	0.98	**2.59**	0.88
NTAV_18M	1.51	**2.43**	0.93	1.39	0.87	**2.16**	1.74	1.62	1.68	0.07	-0.20	-1.22
PNAV_12M	1.72-1.06		1.39	1.15	-0.20	0.70	1.98	0.17-0.	57	-0.52	0.15	0.36
EPS	1.41-0.86		0.93	0.35	-1.95	0.10	0.53	0.03	0.57	0.90	1.05	0.31
POUT	**2.64**	0.78	0.63	0.49	0.04	0.01	-0.11	0.31	0.10	0.21	-0.10	-1.75
NTAV_24M	1.33	0.67	-0.94	0.31	0.42	1.97	1.27	1.12	1.68	1.29	0.64	0.84
LNMV	**2.10**	1.59	0.35	1.98	0.13	0.41	-0.64	1.94	0.06	0.95	0.04	1.91
P_12M	1.45 1.51		-0.73	-0.91	-0.62	-0.46	1.07	1.44-0.	31	-0.70	-1.15	0.11
VO_3M	**3.20**	**2.02**	-1.54	-1.18	-1.49	1.14	-0.36	0.06-0.	57	-0.71	-0.25	1.62
MV	**3.32**	1.75	1.10	1.72	-0.14	0.42	1.02	**2.18**	0.34	-0.03	0.77	**3.58**
TV_3M	1.29	1.18	-0.80	-0.56	-1.24	-0.34	-0.31	-1.46	-0.87	-1.28	0.20	1.14
PNAV_18M	**3.16**	-0.88	0.76	1.08	-0.46	-0.91	0.46	1.00	0.59	-0.27	0.03	0.07
PSALES_6M	-0.58	-0.18	1.12	0.01	-1.04	-0.15	0.48	**2.40**	0.39	**2.14**	-0.73	0.66
CASHPS	**4.73**	**2.33**	0.36	-0.66	**1.99**	1.89	1.79	**2.81**	**4.31**	**3.17**	**2.65**	0.55
INTCOVER_BT	1.14	1.05	-0.27	-0.52	-0.45	-1.04	-0.64	-0.34	-0.11	0.95	0.52	1.04
PSALES_3M	0.34	0.24	-0.13	-1.82	-1.79	0.11	0.13	0.48	0.42	1.72	-0.59	-0.70
PNAV_6M	0.20	0.42	1.14	0.06	-0.80	0.18	0.49	1.65-0.	64	1.05	-1.10	0.06
BTMV_18M	0.63-1.18		1.59	-0.70	1.09	0.07	0.00	0.03-0.	80	-0.10	-1.10	-0.21
LCPS	**5.73**	0.34	-0.39	**2.11**	1.95	0.07	-0.29	**2.47**	1.52	1.05	0.15	-0.29
DEBTNTAV	0.60	0.41	0.34	-0.56	-0.59	0.98	-1.34	1.10-0.	08	-0.11	0.77	0.91
TV_1M	0.93	0.83	0.18	-0.66	-0.95	-1.68	0.49	**-2.47**	0.25	-0.03	0.64	1.51
RI_18M	**2.62**	-1.71	0.01	-0.55	-1.71	-0.93	0.87	1.19-0.	03	-0.59	0.15	0.06
TLCTA	0.42-1.79		0.83	-0.24	-0.66	-0.76	-0.66	-0.060	80	-0.59	0.49	0.13
EPS_3M	0.770.97		0.27	-0.69	-1.41	-0.67	-1.34	-0.48	-0.32	1.78	0.42	1.08
NPBT_18M	0.03	0.66	**-2.17**	1.42	1.19	-0.15	1.38	0.78 0	36	0.87	1.07	0.07
PTCA	**2.71**	-0.69	0.14	0.11	-1.55	0.07	0.60	-0.100	01	1.12	0.43	-1.19
P_6M	0.70-1.79		-0.84	-0.71	-1.36	0.13	0.21	**1.99**	0.08	0.86	-1.31	-0.06
BTMV	0.77	0.32	-0.11	0.34	0.87	-0.56	-0.04	-0.550	45	-0.20	0.53	0.06
CFOPS	1.55-0.32		0.57	**-3.58**	**-3.54**	-0.28	-0.93	1.08	**4.18**	-0.95	0.57	-0.22
DPS_12M	-0.41	-1.76	-0.46	1.07	1.34	-0.24	-0.18	-0.43	-0.28	0.71	-1.58	0.43
BORROW_RATIO	0.52	1.71	1.94	-0.11	-0.03	1.41	0.67	1.15-0.	07	1.04	1.12	-0.49
DPS_18M	-0.17	-1.17	0.43	0.60	**2.02**	-0.66	0.06	-0.64	-1.42	-0.03	-0.09	0.34
STCL	1.28	1.31	0.97	1.27	1.17	-0.29	**-2.23**	0.29	0.01	0.04	**-2.68**	0.11

Table 7.5. Partial-autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the partial autocorrelations of the monthly payoffs to attributes are displayed. T-statistics significant at the 5% level are highlighted and shown in bold. Significant t statistics reject the null hypothesis: The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross-sectional regressions on standardised standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
P	**2.44**	1.04	0.06	0.38	-1.45	0.93	-0.34	1.92	0.41	0.21	1.95	0.50
LNCAPS	1.59	**-2.02**	0.69	0.36	-1.08	-1.34	0.41	-0.27	0.11	1.57	**2.18**	0.45
NTAV_18M	1.51	**2.28**	0.49	1.42	0.38	1.58	0.67	0.79	1.08	0.93	-0.91	-1.75
PNAV_12M	1.72	**-2.11**	**1.99**	0.39	0.07	0.81	1.62	-0.17	-0.21	-1.04	0.08	0.17
EPS	1.41	-1.04	1.14	0.08	-1.92	0.50	0.17	0.25	0.07	0.45	1.07	0.18
POUT	**2.64**	-0.21	0.63	0.27	-0.19	0.04	-0.17	0.38	-0.01	0.21	-0.20	-1.79
NTAV_24M	1.88	0.43	-1.10	0.56	-0.45	1.97	0.90	0.62	1.75	0.57	0.52	0.74
LNMV	**2.10**	1.31	-0.80	**2.07**	-0.32	0.01	0.50	1.88	-0.38	0.56	0.22	1.31
P_12M	1.45	-1.98	-0.29	-1.00	-0.55	0.63	1.00	1.00	-0.42	-0.34	-1.02	0.41
VO_3M	**3.20**	1.36	**-2.40**	-0.53	0.63	1.75	-1.00	-0.49	-0.45	-0.43	0.38	1.69
MV	**3.32**	1.05	0.50	1.32	-0.95	0.38	0.90	1.74	-0.55	-0.50	0.66	**3.34**
TV_3M	1.29	1.07	-1.01	-0.50	-1.01	-0.11	-0.14	-1.59	-0.70	-1.07	0.26	1.05
PNAV_18M	**3.16**	-1.65	1.42	0.49	-0.71	-0.56	0.64	0.66	0.49	-0.39	0.06	-0.20
PSALES_6M	-0.56	0.21	1.11	0.11	-1.01	-0.32	0.43	**2.65**	0.69	**2.16**	-1.02	0.65
CASHPS	**4.73**	0.95	-0.70	-0.83	**2.84**	0.86	0.41	**2.07**	**3.71**	0.70	0.64	-0.45
INTCOVER_BT	1.14	0.97	-0.42	-0.55	-0.35	-0.93	-0.48	-0.15	-0.06	0.93	0.29	0.74
PSALES_3M	0.34	0.22	-0.14	-1.82	-1.74	0.24	0.17	0.22	-0.04	1.58	0.56	-0.56
PNAV_6M	0.20	0.42	1.12	0.03	-0.67	0.11	0.55	1.78	-0.76	0.84	1.39	0.27
BTMV_18M	0.63	-1.21	1.72	-1.01	**2.39**	-0.53	0.74	-0.74	-0.32	-0.57	-1.04	-0.07
LCPS	**5.73**	**-2.80**	0.97	**2.25**	0.07	-0.40	0.36	**2.74**	-1.20	1.05	-0.48	-0.58
DEBTNTAV	0.60	0.38	0.31	-0.60	-0.56	1.05	-1.38	1.19	-0.24	-0.03	0.75	0.66
TV_1M	0.93	0.76	0.08	-0.73	-0.58	-1.51	0.81	**-2.44**	0.48	0.07	0.57	1.28
RI_18M	**2.52**	**-2.24**	0.80	-1.04	-1.36	-0.55	0.60	0.74	-0.29	-0.65	0.21	0.03
TLCTA	0.42	-1.81	0.95	-0.55	-0.39	-0.90	-0.94	0.15	0.64	-0.64	0.62	-0.31
EPS_3M	-0.77	0.93	0.36	-0.73	-1.55	-0.76	1.21	-0.52	-0.34	**-2.01**	-0.06	1.04
NPBT_18M	-0.03	0.66	**-2.17**	1.42	1.42	-0.67	-1.11	0.66	-0.32	-1.45	1.71	0.29
PTCA	**2.71**	-1.24	0.55	-0.10	-1.31	0.76	0.21	-0.17	0.18	0.91	0.10	-1.14
P_6M	0.70	-1.84	-0.67	-0.80	-1.52	0.00	0.28	1.86	-0.25	1.34	-1.28	0.60
BTMV	0.77	0.28	-0.14	0.35	0.54	-0.67	0.01	-0.50	0.46	-0.25	0.62	0.04
CFOPS	1.55	-0.49	0.69	**-3.62**	**-2.81**	0.06	0.81	0.81	**2.69**	**-2.40**	0.66	-0.94
DPS_12M	-0.41	-1.78	-0.59	0.81	1.31	0.08	0.20	-0.45	-0.52	0.48	-1.69	0.52
BORROW_RATIO	0.52	1.69	1.54	-0.47	1.00	1.31	1.12	1.02	-0.80	1.41	1.16	-0.80
DPS_18M	-0.17	-1.17	0.42	0.57	**2.12**	-0.53	0.35	-0.94	-1.59	-0.49	-0.76	0.42
STDL	1.28	1.21	0.75	1.02	0.86	-0.70	**-2.53**	0.62	0.27	0.25	**-2.46**	0.79

First order autocorrelation is found to be significant for the attributes: price (P), payout ratio (POUT), natural logarithm of market value (LNMV), three month change in absolute volume ratio (VO_3M), market value (MV), eighteen month change in price to net asset value (PNAV_18M), cash per share (CASHPS), loan capital per share (LCPS), eighteen month momentum (RI_18M) and price to current assets (PTCA). The positive first and second order autocorrelation for some of the size effects such as P, MV, CASHPS, LCPS and other effects such as PTCA, RI_18M and VO_3M suggest that the 1MA model may have a reasonable predictive power for future payoffs.

Similarly, the risk adjusted results, displayed in appendices D.1. to D.5. show autocorrelation for LCPS, eighteen month change in book to market value (BTMV_18M) and price to net tangible assets (PNTAV). Attributes such as POUT, PNAV_18M, CASHPS, LCPS and PTCA are unlikely to show significant variation over short lags as their numerators or denominators within the ratio contain an accounting value, which is only subject to change on the release of financial results. This inherent rigidity among these attribute values explains their serial autocorrelation. With the exception of CASHPS, all autocorrelation and partial-autocorrelation cease to exist after three lags.

LNCAPS, eighteen month change in net tangible asset value (NTAV_18M), PNAV_12M, LCPS and RI_18M exhibit second order partial-autocorrelation after controlling for the remaining lags. Once again, the serial correlation appears to recede after three lags. The risk adjusted results show a much larger decline in autocorrelations and partial-autocorrelation with only LCPS and NTAV_18M found to be significant for the second order. The decline occurs despite the presence of the same attributes among the risk adjusted payoffs data set.

The Q statistics exhibit significant serial correlation for eight or more lags for attribute payoffs: NTAV_18M, VO_3M, MV, CASHPS, LCPS and cash flow per share (CFOPS). The time series of these attributes display lack of independence and therefore due care should be expressed in the interpretation of their results. The attributes are kept in the sample for further tests, mostly for purposes of completeness and comparability. The Q statistics, which are often used to test for white noise in a series, find autocorrelation for at least 4 lags among attributes P, LNMV, PNAV_18M and RI_18M. The number of lags with significant autocorrelation does however fluctuate and does not show a consistent trend. The risk adjusted tests confirm serial correlation for LCPS, NTAV_18M, CFOPS and NTAV_24M.

The short term autocorrelation structure of attributes P, LNMV and MV provide some evidence to the random walk debate whereby the best estimate of future prices and market values are the most recent ones. The longer term autocorrelation structure of attributes such as CASHPS, LCPS, NTAV_18M and CFOPS can be explained by their construction process and the use of more rigid accounting values. Caution should be applied to attributes that demonstrate more uniform autocorrelation over shorter intervals. Finally, the unit root tests conducted on all payoffs (see appendix D.8) do not provide any evidence of stationarity among the payoffs.

7.3.2. Performance of Style Timing Models

Table 7.6. Correlation t-statistics of Forecasts and Realised Payoffs

The correlations t-statistics between the forecast and realised payoffs are calculated for each standardised style characteristic for each model. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. Correlations significant at the 5% level are displayed in bold. The more significant the correlation, the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	**2.47**	**6.57**	**5.70**	**3.76**	**2.31**	0.63
LNCAPS	Size	1.68	**5.90**	**4.76**	**2.73**	**2.21**	**11.60**
NTAV_18M	Value	1.75	**7.72**	**5.71**	**3.97**	**3.65**	**-4.94**
PNAV_12M	Value	1.74	**6.40**	**4.29**	**3.17**	**2.01**	**-2.80**
EPS	Size	1.38	**5.70**	**4.85**	**2.91**	**2.68**	**-4.62**
POUT	Growth	**2.62**	**6.82**	**4.52**	**2.30**	1.91	**-13.18**
NTAV_24M	Value	**2.07**	**5.98**	**5.55**	**3.88**	**2.55**	**-4.95**
LNMV	Size	**2.09**	**7.21**	**5.13**	**3.56**	**2.03**	**11.68**
P_12M	Momentum	1.48	**4.97**	**3.55**	**2.64**	**2.18**	**-4.58**
VO_3M	Liquidity	**3.16**	**5.45**	**3.52**	**2.63**	**2.41**	**14.39**
MV	Size	**3.33**	**7.57**	**5.62**	**4.23**	**2.05**	**16.50**
TV_3M	Liquidity	1.27	**5.49**	**2.92**	**3.30**	**2.48**	**20.79**
PNAV_18M	Value	**3.08**	**6.36**	**4.10**	**3.52**	1.90	-1.50
PSALES_6M	Value	-0.54	**5.82**	**4.94**	**2.78**	**2.05**	**5.73**
CASHPS	Size	**5.90**	**8.57**	**8.01**	**4.95**	**8.60**	-0.67
INTCOVER_BT	Risk	1.14	**5.93**	**4.10**	**3.56**	**2.44**	1.44
PSALES_3M	Value	0.31	**4.73**	**4.19**	**2.33**	**2.28**	0.27
PNAV_6M	Value	0.20	**6.11**	**4.33**	**2.76**	**2.35**	**-4.45**
BTMV_18M	Value	0.58	**6.59**	**3.10**	**2.40**	**2.08**	0.03
LCPS	Size	**5.92**	**8.24**	**5.67**	**3.64**	**5.53**	0.14
DEBTNTAV	Risk	0.63	**6.00**	**4.24**	**2.44**	**3.27**	**-2.52**
TV_1M	Liquidity	0.92	**5.85**	**3.45**	**3.53**	**3.07**	**24.54**
RI_18M	Momentum	**2.60**	**4.93**	**3.33**	**3.11**	**2.21**	0.10
TLCTA	Risk	0.47	**5.73**	**3.87**	**2.36**	**2.36**	**12.40**
EPS_3M	Growth	-0.77	**5.44**	**2.82**	**3.91**	**2.15**	**18.99**
NPBT_18M	Growth	-0.06	**6.45**	**3.90**	**2.75**	**2.49**	**3.67**
PTCA	Value	**2.70**	**5.78**	**4.48**	**2.56**	**2.17**	**-6.87**
P_6M	Momentum	0.73	**4.64**	**4.03**	**2.36**	**2.18**	**-3.03**
BTMV	Value	0.75	**6.73**	**4.23**	**2.97**	**2.04**	**9.27**
CFOPS	Size	1.47	**3.50**	**3.04**	**2.66**	**3.89**	**-2.54**
DPS_12M	Growth	-0.39	**6.50**	**3.70**	**3.04**	**2.87**	**5.16**
BORROW_RATIO	Risk	0.40	**6.82**	**4.79**	**2.55**	**3.48**	**-6.80**
DPS_18M	Growth	-0.09	**6.66**	**3.76**	**3.44**	**2.41**	**-3.17**
STCL	Risk	1.29	**7.70**	**3.51**	1.94	**1.99**	**-2.82**
Mean		1.54	**6.20**	**4.34**	**3.08**	**2.71**	**2.58**

The results from the unadjusted correlation tests are set out in table 7.6 above and the risk adjusted tests results are found in appendices D.9 and D.10. The correlations t-statistics between forecasted and actual payoffs among the different models reveals that the six month moving average model appears to yield the best results with a mean t-statistic of 6.20 across all attributes. The remaining models perform reasonably well with the exception of the random walk model (1MA) and the AR12 model which both exhibit higher volatility and inconsistency.

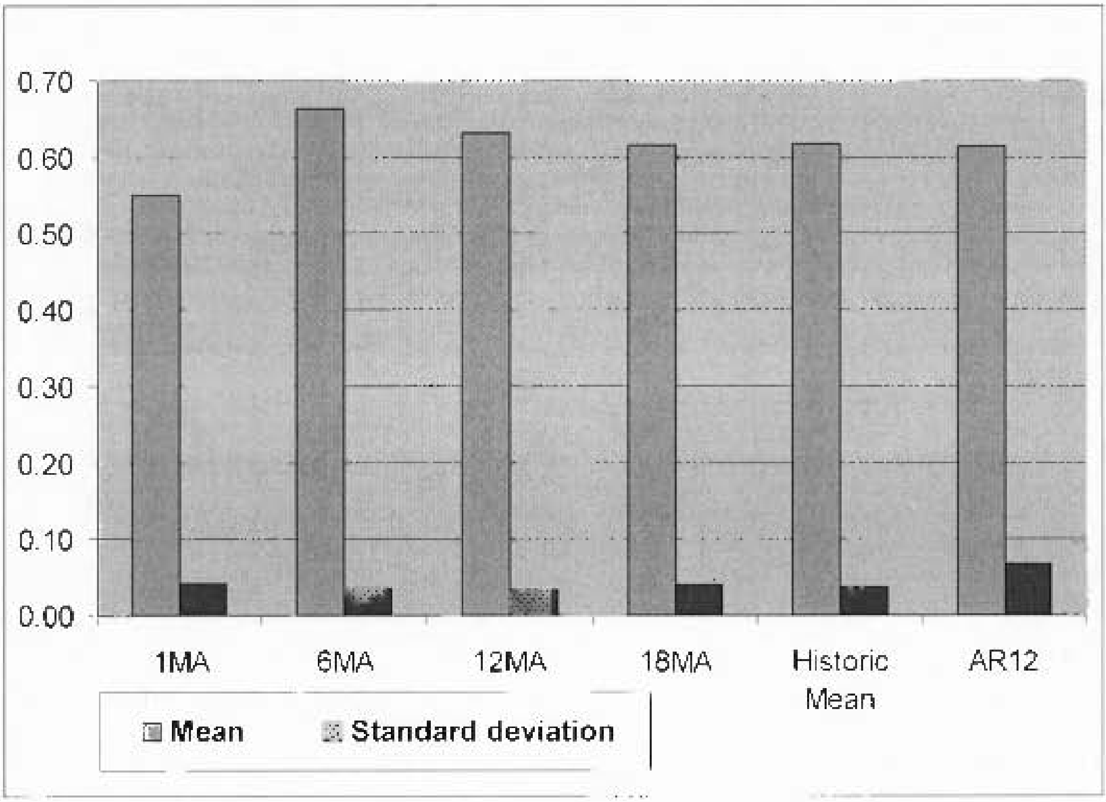
Table 7.7. Direction Ratios Comparing Forecast to Realised Payoffs

Direction ratios display the number of times the payoff directions to each attribute is correctly forecast as a percentage of total forecasts. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The greater the direction ratio, the better the style-timing model. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	0.61	**0.70**	**0.69**	**0.68**	**0.67**	**0.67**
LNCAPS	Size	0.60	**0.68**	0.64	**0.66**	**0.66**	**0.66**
NTAV_18M	Value	0.56	**0.68**	0.65	0.63	0.64	0.63
PNAV_12M	Value	0.63	**0.75**	**0.71**	**0.68**	**0.68**	**0.68**
EPS	Size	0.56	0.63	0.65	**0.66**	0.64	0.64
POUT	Growth	0.60	**0.69**	**0.68**	0.65	**0.67**	**0.67**
NTAV_24M	Value	0.57	**0.70**	**0.66**	0.62	**0.65**	0.60
LNMV	Size	0.53	**0.67**	0.60	0.62	0.62	0.61
P_12M	Momentum	0.55	0.62	**0.65**	**0.66**	**0.67**	0.61
VO_3M	Liquidity	0.53	0.64	0.60	0.61	0.61	0.63
MV	Size	0.59	**0.69**	**0.66**	0.64	0.63	**0.72**
TV_3M	Liquidity	0.53	0.65	0.63	0.63	0.63	0.63
PNAV_18M	Value	0.57	**0.68**	**0.66**	0.64	0.64	0.61
PSALES_6M	Value	0.55	0.62	0.63	0.63	0.64	**0.67**
CASHPS	Size	0.55	0.65	0.65	0.63	**0.65**	0.64
INTCOVER_BT	Risk	0.54	**0.65**	0.64	0.64	0.63	**0.66**
PSALES_3M	Value	0.61	**0.69**	**0.65**	0.65	0.64	0.65
PNAV_6M	Value	0.58	**0.69**	0.62	**0.67**	0.64	0.65
BTMV_18M	Value	0.56	**0.69**	0.62	0.61	0.59	0.56
LCPS	Size	0.58	**0.70**	**0.67**	0.64	0.65	0.63
DEBTNTAV	Risk	0.53	0.61	0.60	0.57	0.58	0.56
TV_1M	Liquidity	0.56	**0.68**	0.63	0.59	0.61	**0.82**
RI_18M	Momentum	0.57	0.63	0.62	0.59	0.56	0.55
TLCTA	Risk	0.53	**0.67**	0.57	0.60	0.61	0.60
EPS_3M	Growth	0.42	0.62	0.57	0.55	0.54	0.60
NPBT_18M	Growth	0.52	0.63	0.65	0.58	0.59	0.58
PTCA	Value	0.56	0.64	0.61	0.55	0.58	0.51
P_6M	Momentum	0.52	0.59	0.62	0.58	0.60	0.60
BTMV	Value	0.60	**0.68**	0.62	0.59	0.59	0.60
CFOPS	Size	0.51	0.63	0.59	0.57	0.63	0.59
DPS_12M	Growth	0.49	**0.70**	**0.65**	0.57	0.57	0.58
BORROW_RATIO	Risk	0.51	**0.67**	0.61	0.54	0.58	0.54
DPS_18M	Growth	0.49	**0.68**	0.59	0.62	0.57	0.49
STCL	Risk	0.51	0.64	0.56	0.54	0.56	0.46
Mean		0.55	0.66	0.63	0.61	0.62	0.61
Standard deviation		0.04	0.03	0.03	0.04	0.04	0.07

Figure 7.1. Average Direction Ratios Comparing Forecast to Realised Payoffs

Direction ratios display the number of times the payoff directions to each attribute is correctly forecast as a percentage of total forecasts. The light bars represent the mean (across the attributes) direction ratios for each model, and the dark bars display the related standard deviation. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The greater the direction ratio, the better the style-timing model.



The direction ratios for the unadjusted sample are displayed in Table 7.7 and Figure 7.1 with the corresponding risk adjusted ratios documented in appendices D.11 and D.12. The direction ratios (correct forecasts as a percentage of total forecasts) across attributes show how frequently the model is able to forecast the direction of the payoffs correctly. The 6MA model provides the most uniform forecasts across attributes followed by the 12MA, 18MA, Historic mean, AR12 and 1MA. The 6MA and 12MA models are the best direction forecasting models and provide the lowest volatility. The results are the same amongst the CAPM and APT risk adjusted models.

The style consistency tests employing the nonparametric Sign Test are displayed in appendix D.13. to D.15. The results show that all attributes reject the null hypothesis that the models predict the correct sign less than 50% of the time.

Table 7.8. Sum of Absolute t-statistics for the regression coefficients

Displays the sum of the absolute t-statistics of the intercept and beta coefficients from regressions performed with the payoffs to each attribute as the dependent variable and the forecasted values as the independent variable. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	8.00	7.23	6.14	4.19	3.46	1.97
LNCAPS	Size	6.77	6.19	5.50	3.01	3.31	21.02
NTAV_18M	Value	6.50	7.71	5.98	4.70	4.38	11.74
PNAV_12M	Value	6.49	6.58	4.65	3.67	2.90	7.64
EPS	Size	5.85	6.08	5.35	3.34	4.00	10.50
POUT	Growth	6.54	7.14	4.71	3.21	2.60	27.68
NTAV_24M	Value	5.81	6.13	5.54	3.90	3.09	11.13
LNMV	Size	6.00	7.50	5.22	4.24	2.09	18.02
P_12M	Momentum	5.15	5.44	3.63	2.96	2.76	10.78
VO_3M	Liquidity	6.50	6.29	4.10	3.22	2.90	24.08
MV	Size	6.52	7.98	5.74	4.80	2.23	22.68
TV_3M	Liquidity	4.71	5.94	3.37	4.08	3.97	36.45
PNAV_18M	Value	5.90	6.76	4.73	3.68	2.19	4.76
PSALES_6M	Value	4.14	5.99	5.23	3.44	2.73	9.52
CASHPS	Size	8.02	8.98	8.40	5.08	12.95	3.40
INTCOVER_BT	Risk	3.75	6.15	4.21	3.68	3.37	1.55
PSALES_3M	Value	3.18	5.23	4.59	2.64	3.86	0.96
PNAV_6M	Value	2.96	6.26	4.57	3.48	3.56	9.53
BTMV_18M	Value	3.29	7.06	3.30	2.75	2.58	2.18
LCPS	Size	7.77	8.44	5.70	3.86	8.57	2.09
DEBTNTAV	Risk	3.19	6.20	4.45	2.63	4.90	5.63
TV_1M	Liquidity	3.29	6.13	3.71	3.52	4.86	25.25
RI_18M	Momentum	4.31	5.45	3.93	3.23	2.32	1.88
TLCTA	Risk	2.78	5.79	4.20	2.45	3.40	21.78
EPS_3M	Growth	3.20	5.57	2.93	4.55	3.27	30.33
NPBT_18M	Growth	2.27	6.62	4.02	2.86	4.00	5.69
PTCA	Value	4.46	6.16	4.56	3.11	3.33	13.87
P_6M	Momentum	2.71	5.01	4.32	2.75	3.04	6.66
BTMV	Value	2.82	6.74	4.29	3.21	2.74	13.30
CFOPS	Size	3.44	4.21	3.67	3.22	5.44	5.38
DPS_12M	Growth	2.49	7.09	3.69	2.90	4.40	7.82
BORROW_RATIO	Risk	2.32	6.88	5.14	2.63	4.74	12.16
DPS_18M	Growth	2.15	6.77	3.55	3.20	2.89	6.23
STCL	Risk	3.06	7.79	3.68	2.43	2.46	6.27
Mean		4.60	6.51	4.61	3.43	3.80	11.76
Standard deviation		1.84	0.99	1.07	0.69	2.03	9.31

Table 7.9. Average Theil Inequality Coefficient for Style-timing Models

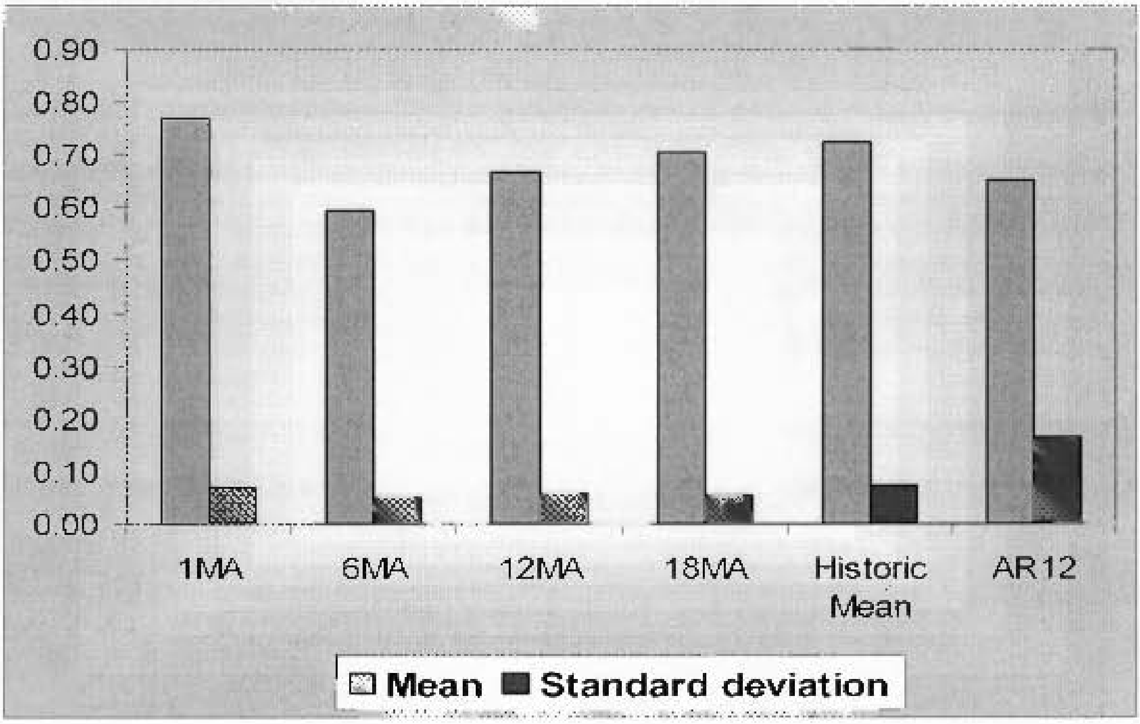
Theil (1958) Inequality Coefficients are calculated for each standardised style characteristic for each style-timing model. The Theil Inequality Coefficient lies between zero and one. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the coefficient, the better the style-timing model. Values below 0.6 are displayed on bold. The best timing model has been highlighted.

Attribute	Grouping	Model Type 1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	**0.58**	**0.50**	**0.52**	**0.55**	**0.59**	**0.59**
LNCAPS	Size	0.63	**0.54**	**0.58**	0.62	0.63	**0.40**
NTAV_18M	Value	0.63	**0.49**	**0.54**	**0.59**	**0.59**	**0.57**
PNAV_12M	Value	0.64	**0.52**	**0.57**	**0.60**	0.63	0.61
EPS	Size	0.68	**0.58**	0.61	0.65	0.66	**0.60**
POUT	Growth	0.67	**0.55**	0.62	0.68	0.68	**0.38**
NTAV_24M	Value	0.67	**0.56**	**0.58**	0.64	0.66	0.60
LNMV	Size	0.69	**0.54**	0.60	0.64	0.69	**0.41**
P_12M	Momentum	0.71	0.61	0.65	0.66	0.69	0.63
VO_3M	Liquidity	0.68	0.60	0.66	0.68	0.70	**0.36**
MV	Size	0.68	**0.54**	0.60	0.64	0.72	**0.33**
TV_3M	Liquidity	0.75	0.62	0.70	0.68	0.72	**0.28**
PNAV_18M	Value	0.70	**0.57**	0.64	0.67	0.73	0.73
PSALES_6M	Value	0.77	0.61	0.64	0.71	0.74	0.61
CASHPS	Size	0.62	**0.53**	**0.55**	0.67	**0.53**	0.75
INTCOVER_BT	Risk	0.80	0.63	0.70	0.72	0.76	0.83
PSALES_3M	Value	0.81	0.67	0.69	0.76	0.76	0.81
PNAV_6M	Value	0.81	0.62	0.68	0.74	0.76	0.67
BTMV_18M	Value	0.80	**0.59**	0.74	0.76	0.77	0.81
LCPS	Size	0.63	**0.55**	0.64	0.73	0.65	0.75
DEBTNTAV	Risk	0.82	0.63	0.70	0.79	0.74	0.79
TV_1M	Liquidity	0.82	0.63	0.72	0.71	0.75	**0.24**
RI_18M	Momentum	0.78	0.66	0.71	0.72	0.78	0.84
TLCTA	Risk	0.84	0.64	0.72	0.79	0.79	**0.43**
EPS_3M	Growth	0.84	0.65	0.77	0.72	0.79	**0.31**
NPBT_18M	Growth	0.84	0.61	0.71	0.77	0.77	0.73
PTCA	Value	0.78	0.64	0.70	0.78	0.80	**0.59**
P_6M	Momentum	0.85	0.68	0.71	0.78	0.80	0.76
BTMV	Value	0.85	0.61	0.70	0.76	0.81	**0.51**
CFOPS	Size	0.82	0.74	0.77	0.73	0.72	0.80
DPS_12M	Growth	0.86	0.61	0.74	0.77	0.78	0.67
BORROW_RATIO	Risk	0.86	0.61	0.70	0.81	0.75	0.61
DPS_18M	Growth	0.86	**0.60**	0.73	0.76	0.79	0.75
STCL	Risk	0.85	**0.58**	0.75	0.82	0.82	0.77
Mean		0.75	0.60	0.67	0.71	0.72	0.00
Standard deviation		0.09	0.05	0.07	0.07	0.07	0.18

The regressions between payoffs and their forecasted values and the Theil Inequality Coefficients confirm the findings of the correlation and consistency tests. The six month moving average model (6MA) again proves to be the most accurate and consistent model holding the most predictive power for actual payoffs. It also demonstrates the least volatility when compared to the others. The 12MA and the 18MA are the next best models. The 1MA, historic mean and AR12 models provide less accurate forecasts and variation begins to escalate. The attributes that displayed significant positive autocorrelation show better 1MA results than other attributes. The results of the corresponding CAPM and APT risk adjusted model tests are identical to the findings above and are displayed in appendices D.16 to D.19. Figure 7.2 displays the average Theil coefficients and standard deviations of the classified models.

Figure 7.2. Average Theil Inequality Coefficient for Style-timing Models

Theil (1958) Inequality Coefficients are calculated for each standardised style characteristic for each style timing model. The light bars represent the mean Theil Inequality Coefficients (across the attributes) for each model, and the dark bars display the standard deviation. The Theil Inequality Coefficient lies between zero and one. The realised monthly payoffs are derived from univariate cross sectional regressions on standardised CAPM total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the coefficient, the better the style-timing model.



All performance measures used to test the six timing models advocate a six or twelve month moving average model to exploit abnormal returns and forecast future payoffs. Practitioners seeking to take advantage of anomalies should also consider the individual style timing qualities of each attribute.

A multitude of attributes have a more robust directional bias over the sample period. These attributes are discussed in Section 6.3 of chapter six. A trading strategy based on purchasing securities that are skewed towards the appropriate firm specific characteristic, when the payoff direction deviates from its biased direction, may prove to outperform over the longer term. This may well offer an alternate strategy to the six month moving average approach for strongly biased attributes.

7.4. Summary and conclusion

This chapter assesses the nature of the time series of attribute's payoffs derived in Chapter six and the ability to forecast future payoffs. Thorough analysis of the nature, consistency and forecasting power of models provides a framework for base trading strategies to exploit abnormal returns. All tests are conducted on unadjusted (raw return), CAPM risk adjusted and APT risk adjusted samples.

Autocorrelation and stationarity tests are carried out to investigate the nature of all unadjusted and risk adjusted payoffs. Six style timing models that forecast future payoffs are created. These models are tested using a variety of performance measures to analyze the accuracy of forecasted payoffs and the consistency of forecasts.

The autocorrelation tests show that several attributes do show significant autocorrelation for up to three lags, after which it tends to disappear. The serial correlation among attributes is reasonably well dispersed and appears inconsistent. The more pervasive autocorrelation among attributes such as CASHPS, LCPS, NTAV_18M and CFOPS, can be explained by their construction process which uses fairly rigid accounting values. The unit root tests conducted on all payoffs do not provide any evidence of stationarity among the payoffs.

The performance measures used to rank the style timing models present a similar picture across all tests. Consistency, accuracy and variability of the models' ability to forecast future payoffs are used to assess their predictive strength. The six month moving average model fairs the best followed by the twelve month moving average and eighteen month moving average. The historic mean, one month model (which uses the previous month's payoff) and the twelve-lag autoregressive model show the weakest results.

The ability to time the payoffs to the style attributes enables the investor to improve the performance of a style-based strategy. The payoff size and payoff direction of attributes are not predictable and the more significant attributes such as Price (P), payout ratio (POUT) and changes in net tangible assets (e.g. NTAV_18M) show better results and predictability than the less significant attributes. This suggests that their payoffs may not necessarily be more predictable, but rather have a more consistent direction bias than the other attributes.

While the six month moving average model yields the best performance when compared to the other models, a trading strategy based on accumulating securities when the payoff direction deviates from its biased direction, may well prove to outperform over the long term.

The findings of this chapter do suggest that the performance of the significant attributes can, to some extent, be improved by using the six or twelve month moving average of the cross sectional payoffs to forecast the next month's payoff.

Chapter eight provides a closer look at strategies that aim to exploit the anomalous attribute's directional biases witnessed in the last two chapters.

-8-

Industry Specific and Portfolio Sorting Analysis

8.1. Introduction

This chapter investigates two important aspects of style-based anomalies among Canadian equities, namely: (1) The presence of firm specific attributes among three classified sectors or industries, and (2) The ability to exploit style-based anomalies after accounting for transaction costs.

There are two main objectives of this chapter: (1) To conduct industry specific analysis. This entails splitting Canadian equities into three related sectors and identifying the anomalous attributes specific to each; (2) To conduct portfolio sorting using the style-based anomalies in this study. The portfolio sorts explore three facets. Firstly, the returns to risk of trading strategies are examined. This employs a portfolio sorting methodology that tests the pervasiveness of anomaly returns after accounting for transaction costs. Secondly, risk adjusted tests are carried out using a long short returns portfolio. Thirdly, the ability of attributes and their loadings, to explain share returns are assessed.

The tests are conducted using unadjusted, CAPM risk adjusted and APT risk adjusted monthly returns.

The remainder of the chapter is set out as follows: Section 8.2 discusses the data and methodologies employed, Section 8.3 reports the results, and Section 8.4 summarises and concludes.

8.2. Data and methodology

8.2.1. Industry specific Analysis

So far, all tests conducted for anomalous attributes throughout this study use the entire data set which contains all the securities that form the S&P TSX Composite index. All significant attributes found in Chapter Six therefore represent a 'generalised' presence of anomalies across the entire data set. This section aims to investigate whether significant attributes are specific to similar firm types or sectors. It also explores whether they display a stronger or weaker presence amongst these sectors.

The monthly returns and attributes data of all shares are subdivided into the ten separate industries that are classified by the DataStream International data service. The DataStream International industries consist of: (1) Utilities, (2) Information Technology, (3) Cyclical goods, (4) Cyclical services, (5) Resource firms, (6) Basic materials firms, (7) General Industries, (8) Non-cyclical goods, (9) Non-cyclical services and (10) Financials.

The ten industries are concatenated into three broad sectors, namely: *Basic Materials, Cyclicals and Non-Cyclicals*. Basic Materials are comprised of resource and basic materials firms. Cyclicals are made up with firms from cyclical goods and services, financials and general industries. Non-Cyclicals contain equities from utilities, information technology and non-cyclical goods and services.

Cross sectional regressions using Ordinary Least Squares (OLS) are performed for each month against the unadjusted, CAPM risk adjusted and APT risk adjusted returns of the shares. The methodology is the same regression methodology implemented in Chapter Six and follows that of Fama and Macbeth (1973) and van Rensburg and Robinson (2003). The mean slope coefficient for each attribute over the sample period, 31 January 1989 to 31 July 2005, is tested for significance using Student's t-test.

8.2.2. Portfolio Sorting Analysis

8.2.2.1. Return to Risk Analysis

The results from the tests conducted in Chapter Six and Seven confirm the existence of anomalous attributes among the shares that form the S&P TSX Composite index. While much literature has been devoted to the exploration of financial anomalies on listed securities around the world, the question of whether such anomalies can be exploited using trading strategies, with consideration for transactions costs, often remains unanswered. This section investigates the profitability of trading strategies using the anomalous attributes uncovered in Chapter Six of this study.

A portfolio sorting methodology using an equal weighting for all equities is implemented to test the viability of portfolio trading strategy for each significant attribute. All the samples' share returns earned for a particular month are sorted and ranked according to the attribute (e.g. '*market value*') at the beginning of that month so as to negate the look ahead bias. This creates a list of shares ranked by their market value with a corresponding return earned over that month. The shares' earned returns, ranked according to the attribute (in this case market value), are then divided into portfolios. The number of portfolios plays a critical role in 'leveraging' the anomaly. A greater number of portfolios reduces the number of equities in each, ensuring that the highest and lowest portfolio hold more extreme and divergent exposures to the style based anomaly. By increasing the magnitude of portfolios, the disparity in returns can be compared and examined. Permutations of two to fifty portfolios are executed. For ease of explanation, five portfolios or quintiles will be discussed from here on.

Each month, as the shares' attribute rank changes, each quintile is likely to contain new shares. To complete the trading strategy, a '*purchased*' or '*sold*' share incurs a transaction cost of 1% in each case. The transaction costs are deducted from the share returns for the month. Therefore, a *roundtrip* transaction (buying and selling) amounts to 2% for each share.

The returns of the bottom quintile and top quintile, which contain shares with the lowest and highest market values respectively, are calculated and stored. A mean for the two quintiles is then calculated for that month assuming an equal weighting to the quintile's shares. This monthly sorting procedure is repeated for all the months over the entire sample period: 31 January 1989 to 31 July 2005.

A mean monthly return and annual average return is calculated from the total return of the post transaction costs trading strategy. The monthly standard deviation of returns is divided by the mean monthly returns to formulate an altered version of the Sharpe ratio (Mean less the risk-free rate divided by standard deviation). This ratio provides insight into the 'reward' generated per unit of risk for each trading strategy. In order to assess the viability of the strategy a benchmark annual average return and Sharpe ratio for the equally weighted market portfolio is devised. The benchmark assumes a buy and hold strategy of the equally weighted market portfolio of all shares from 31 January 1989 to 31 July 2005.

Trading strategies tests are carried out using the unadjusted, CAPM risk adjusted and APT risk adjusted returns of the shares. Risk adjusted tests are conducted to evaluate the trading strategies after removing systematic risk. The corresponding benchmarks for these strategies are created.

The numerous permutations of portfolio tests for each attribute show the returns and the risk of raising exposure to financial anomalies. The differences between the highest and lowest portfolio for each attribute signify the abnormal returns that can be generated by skewing the equity weightings towards anomalous attributes. Such differences are likely to vary based on the extremity of exposure to an attribute. For instance, a portfolio holding say five of the smallest companies (ranked according to the *market value* attribute) is likely to have even higher returns than a portfolio holding one hundred of the smallest companies if the hypothesized size effect proves to hold.

While higher returns are likely to be obtained through higher exposure, the extent of the risk taken up should be considered. Here, the Sharpe ratio plays its role of evaluating the reward to risk relationship. The importance of this ratio stems from the primary role of finance (under the umbrella of economics), which aims to maximize gains from the scarce resources available whilst considering the risk.

8.2.2.2. Risk adjusted evaluation

In addition to the returns to risk analysis, risk adjusted portfolio evaluation is carried out using a highest portfolio less lowest portfolio returns set. The returns set is equivalent to a long-short portfolio using the two most extreme portfolios extracted from the returns to risk analysis.

Risk adjustment is conducted on the long short portfolio using the traditional CAPM and APT model derived in the Chapter 4. The specifications for the two models respectively are:

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \tag{8.1}$$

$$(r_{i,t} - r_{f,t}) = \alpha_i + \beta_{Index1,i}(r_{index1,t} - r_{f,t}) + \beta_{Index2,i}(r_{index2,t} - r_{f,t}).. \\ + \beta_{indexK,i}(r_{indexK,t} - r_{f,t}) + \varepsilon_{i,t} \tag{8.2}$$

For (8.1):

$r_{i,t}$ = realised return for the style portfolio i for month t

α_i = constant intercept term

β_i = slope coefficient estimated from the regression

$r_{m,t}$ = realised return on the market for month t

$r_{f,t}$ = risk-free rate for month t

$\varepsilon_{i,t}$ = residual error

and (8.2):

$r_{i,t}$ = *realised return for the style portfolio i for month t*

$r_{f,t}$ = risk-free rate for month t

α_i = constant intercept term

$r_{index,t}$ = returns for the K indices over the period t.

$\varepsilon_{i,t}$ = residual error term for the regression

The various intercept coefficients and their corresponding t-statistics and the R square of the regressions are reported in all cases with exception to the APT's independent variable slopes. The results provide insight into the persistence of the attributes after removing systematic risk.

8.2.2.3. One way stock sort procedure

The van Rensburg and Robertson (2003) sort methodology, a variation of Daniel and Titman (1997), is employed to establish whether the attributes themselves or the factor loading on the attributes explain share returns. Fama and French (1993), using US data demonstrate that firm size and the book to market ratio are proxies for risk from which (loadings) coefficients can be derived. They further show that the loadings are able to explain the excess returns of book to market and size portfolios. Daniel and Titman (1997) use a two sorting methodology and reveal that US share returns are best explained by the attributes themselves rather than the attribute loadings. Conducting the same tests on Japanese shares, Daniel and Titman (2001) again find support for the attributes' ability to explain returns.

Factor loadings are estimated by regressing the monthly share returns on the long short portfolio:

$$r_{i,t} = \alpha_i + \beta_{HML} r_{HML,t} + \varepsilon_{i,t}$$

The $r_{i,t}$ represents the actual return for stock i for month t, α_i is the intercept term,

β_{HML} is the slope coefficient or attribute loading, $r_{HML,t}$ is the return of the High minus low (long short) portfolio for month t and $\varepsilon_{i,t}$ is the residual error. The attribute loadings for each share, for each month, are calculated using a rolling window estimation procedure, whereby the first 12 months are used to estimate the first loading, after which every additional month is added to the regression. A time series of loadings, for each of the 39 attributes, for each share is thus created resulting in greatly extended data set.

To examine whether share returns are related to the attributes or their respective loadings, the van Rensburg and Robertson (2003) sort methodology is employed. Similar to the returns to risk analysis, the loadings are sorted in each month by ranking the loadings from highest to lowest, and dividing into quintiles. The corresponding share returns for the highest and lowest quintiles are stored and averaged for each month. For a negatively related attribute, e.g. Market value, the lowest portfolio for the attribute should outperform the highest one. The highest factor loading portfolio, however, is expected to outperform lower loadings if the proposed loading is able to explain share returns.

For both attribute and loading, their respective highest and the lowest portfolios time series returns are tested to assess whether they are different. Students t test is employed. If the loadings' high and low returns are not different from each other, while the attributes' returns are, the case for attributes explaining share returns will be supported.

Finally, the correlation between the attribute and its respective loading is calculated for a rolling window 16 year period. This tests the relationship between loadings and attributes. The relationship should be inverse.

All above mentioned portfolio tests aim to provide an understanding of how active financial practitioners can tilt their portfolios and improve the reward to risk ratios of their assets managed. Finally, they also stand to either confirm or refute the findings of all the research conducted thus far in this study.

Table 8.1 below exhibits the style attributes used for both Industry specific and Portfolio sorting tests.

Table 8.1. Attributes used in the Industry Specific and Portfolio Sorting Analysis

The following attributes are used throughout the analyses conducted in this chapter. The table includes the name of each attribute and its corresponding Style grouping. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Name	Grouping
P	Price	Size
LNCAPS	Natural log current assets per share	Size
NTAV_18M	Net Tangible Asset Value [18 Month change]	Growth
PNAV_12M	Price to Net asset value [1 year change]	Value
EPS	Earnings per share	Size
POUT	Payout ratio	Growth
NTAV_24M	Net Tangible Asset Value [2 Year change]	Growth
LNMV	Natural log Market value	Size
P_12M	Price [1 year change]	Momentum
VO_3M	Absolute trading volume [3 Month change]	Liquidity
MV	Market Value	Size
TV_3M	Trading volume ratio [3 Month change]	Liquidity
PNAV_18M	Price to Net asset value [18 Month change]	Value
PSALES_6M	Price to sales [6 Month change]	Value
CASHPS	Cash per share	Size
INTCOVER_BT	Interest cover before tax	Risk
PSALES_3M	Price to sales [3 Month change]	Value
PNAV_6M	Price to Net asset value [6 Month change]	Value
BTMV_18M	Book to market value [18 Month change]	Value
LCPS	Loan capital per share	Size
DEBTNTAV	Debt to net tangible asset value	Risk
TV_1M	Trading volume ratio change 1M	Liquidity
PNTAV	Price to Net tangible asset value	Value
P_18M	Price [18 Month change]	Momentum
TLCTA	Loan capital to assets	Risk
EPS_3m	Earnings per share [3 Month change]	Growth
NPBT_18M	Net profit before tax [18 Month change]	Growth
PTCA	Price to current assets	Value
P_6M	Price [6 Month change]	Momentum
BTMV	Book to market value	Value
CFOPS	Cash flow from operations per share	Size
DPS_12M	Dividend per share [1 year change]	Growth
BORROW_RATIO	Borrowing ratio	Risk
DPS_18M	Dividend per share [18 Month change]	Growth
STCL	Borrowing ratio	Risk
TDTTA	Total debt to Total assets	Risk
STTD	Sales to total debt	Risk
PCASHPS	Price to cash per share	Value
TV	Trading volume ratio	Liquidity

8.3. Results

8.3.1. Industry Specific analysis

Table 8.2. Significant Attributes specific to three identified sectors

Univariate cross sectional regressions of standardised firm specific attributes on unadjusted total monthly returns data over the period January 1989 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic. The table displays the attributes significant at the 5% level using Student's (1908) t-test in ascending order of significance. Basic Materials are comprised of resource and basic materials firms. Cyclicals are made up with firms from cyclical goods and services, financials and general industries. Non Cyclicals are comprised of utilities, information technology and non-cyclical goods and services. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	Basic Materials		Cyclicals		Non Cyclicals	
		t-statistic	Mean payoff	t-statistic	Mean payoff	t-statistic	Mean payoff
NTAV_18M	Value	5.84	0.009	4.58	0.007	3.45	0.007
POUT	Growth	-5.65	0.007	-3.97	-0.005	-3.46	-0.006
P	Size	-5.33	-0.008	-4.32	0.008	-5.82	-0.009
PNAV_12M	Value	5.04	0.008	4.04	0.008	4.83	0.012
LNCAPS	Size	-4.79	-0.008	-4.95	-0.009	-4.33	-0.010
NTAV_24M	Value	4.04	0.006	3.17	0.005	2.42	0.005
PSALES_6M	Value	3.97	0.008	2.62	0.005	2.83	0.006
PNAV_18M	Value	3.92	0.008	2.71	0.005	4.22	0.010
MV	Size	-3.91	-0.004	-2.95	-0.004	-2.37	-0.003
PSALES_3M	Value	3.87	0.005	2.37	0.005	3.46	0.007
LNMV	Size	-3.74	-0.008	-2.73	-0.007	-2.99	-0.006
EPS	Size	-3.72	-0.004	-3.20	0.004	-3.54	-0.005
VO_3M	Liquidity	3.59	0.007	2.13	0.004	[illegible]	0.002
TV	Liquidity	3.58	0.004	1.48	0.002	1.21	0.002
PNAV_6M	Value	3.21	0.006	2.12	0.005	3.23	0.008
TV_3M	Liquidity	3.14	0.004	1.73	0.002	1.64	0.003
NPBT_18M	Growth	2.83	0.004	0.98	0.002	-0.45	-0.002
EPS_3M	Growth	2.57	0.003	1.75	0.002	-0.45	-0.001
BORROW_RATIO	Risk	-2.40	-0.004	-1.50	-0.004	0.67	0.001
LCPS	Size	-2.31	-0.270	-1.26	-0.112	-3.29	-0.005
DEBTNTAV	Risk	-2.29	-0.004	-1.50	-0.002	-1.32	-0.003
CASHPS	Size	-2.28	-0.079	-1.51	-0.025	-4.45	-0.005
INTCOVER_BT	Risk	2.19	0.003	1.96	0.002	0.41	0.001
P_12M	Momentum	2.17	0.004	4.10	0.009	3.71	0.010
PTCA	Value	2.05	0.003	[illegible]	0.002	1.23	0.003
BTMV_18M	Value	1.95	0.003	1.83	0.006	1.51	0.004
TLCTA	Risk	-1.88	-0.002	-1.50	-0.003	-0.40	-0.001
TDTTA	Risk	-1.65	-0.002	1.45	-0.002	0.12	0.000
RI_18M	Momentum	1.49	0.003	1.66	0.004	2.33	0.006
DPS_12M	Growth	1.47	0.002	1.80	0.002	0.45	0.001
BOR_REPAY_24M	Growth	-1.36	-0.002	-0.82	-0.001	0.21	0.001
P_6M	Momentum	1.34	0.003	1.94	0.005	2.27	0.006
STCL	Risk	-1.07	-0.001	-0.80	-0.001	-1.20	-0.002
BTMV	Value	0.98	0.001	1.37	0.008	1.09	0.002
DPS_18M	Growth	0.63	0.001	1.56	0.002	-0.47	-0.001
STTD	Risk	0.51	0.001	2.20	0.003	-0.10	0.000
TV_1M	Liquidity	0.51	0.001	0.82	0.001	0.31	0.000
PNTAV	Value	-0.27	0.000	-1.02	-0.002	-1.11	-0.002
CFOPS	Size	0.04	0.000	-1.42	-0.004	-0.84	-0.002

Table 8.2 above presents the significant attributes in the unadjusted cross sectional regressions of the Basic materials, Cyclicals and Non cyclical sector portfolios. The detailed test results are tabulated in appendices E.1 to E.4.

The tests yield noticeably less anomalous characteristics than the Chapter Six tests, which include all shares within the sample. A common thread of size, growth and value effects exist among the three groups. The attributes: eighteen month change in net tangible asset value (NTAV_18M), payout ratio (POUT), price (P) and natural logarithm of current assets per share (LNCAPS) are the most significant in all three specified groups. Plausible economic rationale for some of the remaining attributes in each sector is provided below.

The Basic materials share grouping contains a myriad of 'business risk' and "value" and liquidity orientated characteristics, namely: debt to net tangible asset value (DEBTNTAV), borrowing ratio (BORROW_RATIO), three and six month change in price to sales ratio (PSALES_3M and PSALES_6M), eighteen month change in price to net asset value (PNAV_18M), trading volume ratio (TV), three month change in trading volume ratio (TV_3M) and three month change in absolute volume ratio (VO_3M). These attributes most probably reflect investor's consideration for bankruptcy, business risk and trading liquidity. These risks appear to be endemic to the resource sector owing to the volatile nature of resource companies' profits which stem from commodity prices fluctuations. Companies with low debt levels and better tradability (*ceteris paribis*) are more attractive amongst primary sector investors and are accordingly awarded better returns.

Cyclicals shares show four significant liquidity characteristics: VO_3M, TV, TV_1M and TV_3M. Investors appear willing to place a liquidity premium on firms exposed to business and industrial cycle fluctuations more so than with Non cyclical counterparts. This seems intuitive as business cycles downturns tend to be somewhat unpredictable and abrupt. Thinly traded cyclical shares hold greater risk to sell-offs as shareholders cannot reduce their equity holdings without adversely affecting the price. A premium is therefore placed on shares that boast trading liquidity. Equities comprising the Non-Cyclicals sector appear to be dominated by size, value and momentum effects.

The firm specific tests seem to unlock a number of anomalies that are predominant among certain types of shares or sectors. In doing so, the tests provide a greater understanding of the facets that concisely explain equity returns.

8.3.2. Portfolio Trading Analysis

8.3.2.1. Returns to Risk Analysis

Table 8.3. Results from the Portfolio trading strategy using Quintiles

The table displays the annual average return and Sharpe ratio for each attribute's highest and lowest quintile portfolios using unadjusted monthly returns. The same measures for the equally weighted market portfolio (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. Attributes that show higher annual returns at a lower risk than the benchmark are in bold. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter Six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Unadjusted Results (Quintiles)				
	Highest Portfolio		Lowest Portfolio	
Attribute	Annual Average Return	Sharpe ratio	Annual Average Return	Sharpe ratio
P	4.70%	0.11	**44.41%**	**0.48**
LNCAPS	7.67%	0.16	**40.20%**	**0.46**
NTAV_18M	**38.77%**	**0.55**	1.19%	0.05
PNAV_12M	**38.47%**	**0.51**	5.44%	0.10
NTAV_24M	**34.07%**	**0.50**	4.43%	0.09
LNMV	13.55%	0.30	**38.54%**	**0.43**
P_12M	**44.81%**	**0.53**	10.27%	0.15
VO_3M	**31.63%**	**0.46**	15.85%	0.28
MV	13.57%	0.30	**38.32%**	**0.43**
TV_3M	**27.97%**	**0.45**	15.94%	0.30
PNAV_18M	**32.58%**	**0.44**	10.12%	0.16
PSALES_6M	**29.65%**	**0.43**	10.75%	0.17
CASHPS	8.04%	0.16	**31.40%**	**0.48**
INTCOVER_BT	**32.25%**	**0.53**	-2.86%	-0.01
PSALES_3M	**30.68%**	**0.45**	12.94%	0.20
PNAV_6M	**31.79%**	**0.42**	10.30%	0.16
LCPS	9.44%	0.2'	**32.54%**	**0.44**
TV_1M	**25.77%**	**0.42**	17.44%	0.32
RI_18M	**37.16%**	**0.45**	17.48%	0.23
P_6M	**37.46%**	**0.47**	14.96%	0.21
BTMV	**31.04%**	**0.45**	13.85%	0.22
Equal weighted market portfolio	21.85%	0.41	21.85%	0.41

The existence of anomalies and findings of Chapter Six are confirmed. Table 8.3 above displays the results of attributes that outperform and have a higher Sharpe ratio than the equally weighted market portfolio when shares are split up into quintiles. The table is segregated into the two portfolios (lowest and highest quintile) that contained shares with the lowest and highest anomaly ranking. For example, the lowest quintile for Market Value (MV), which includes the smallest companies, earns an average 38.32% per annum compared to the 13.57% that the largest shares quintile would have delivered. In almost all cases, a substantial difference exists between the returns and risk of the two portfolios. The noteworthy differences provide persuasive evidence for both the existence of financial anomalies and the ability to exploit them.

The best quintile (values shown in bold) demonstrates that investors who tilted exposure to a certain anomaly would have earned excess returns at lower risk than a buy and hold approach even after transaction costs. The created benchmark for the buy and hold strategy is conservative with regards to annual returns. An equally weighted market portfolio, by virtue of its construction, earns higher returns than a market weighted portfolio as the trend for smaller companies to outperform their larger counterparts appears to be robust over time.

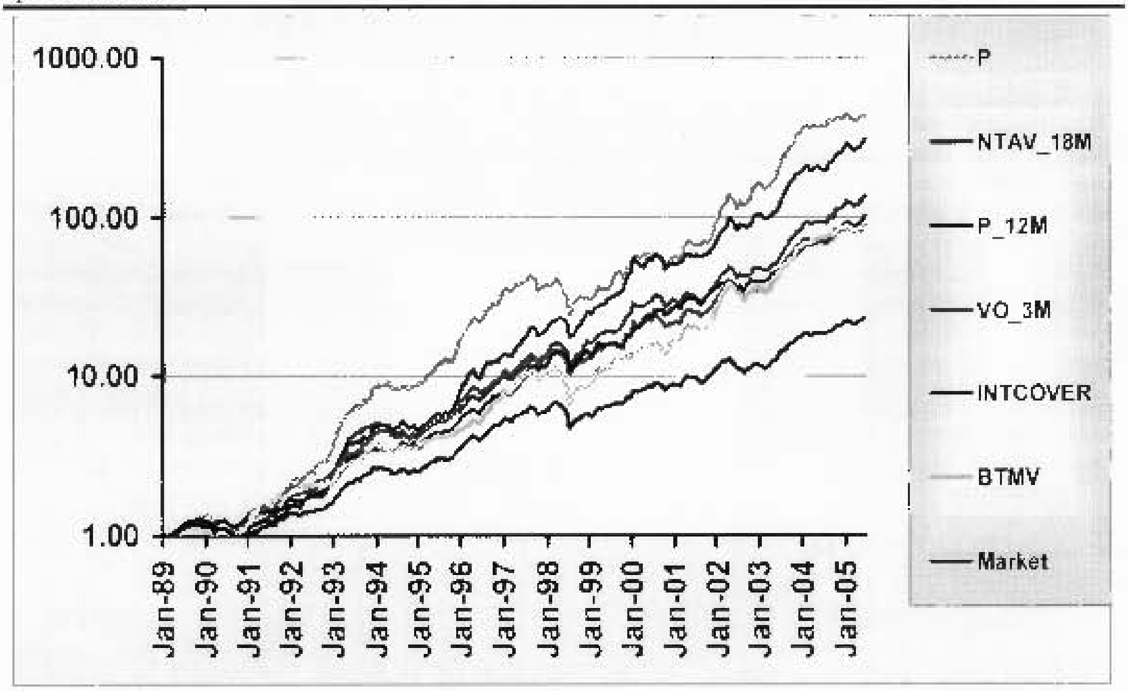
Rationale for each anomaly's performance and style classification furthermore becomes evident. Small companies tend to grow quicker and outperform large ones. Firms with higher interest cover outperform risky firms with poorer abilities to pay their debt. Companies with high book to market ratios are arguably oversold and present value when their market values are close to their accounting asset value. The shares with the highest price momentum rankings continue to deliver higher returns over time. Companies with the highest growth rates in real net tangible assets perform better than average companies with considerably less risk. And so on and so forth.

Only five of the anomalies listed above (P, P_12M, P_6M, BTMV and MV) have been documented in the literature relating to abnormal returns among Canadian equities. The remainder provide evidence that other firm specific attributes exist and have been able to deliver excess returns to investors. Furthermore, returns are generated at a lower risk than the benchmark after transaction costs are accounted for.

Figure 8.1 provides a logarithmic plot of the cumulative returns earned over time by investing in the most profitable quintile (highest or lowest depending on plotted attributes). The plot includes attributes ranging across the different style groups.

Figure 8.1. Cumulative returns from the Portfolio trading strategy using Quintiles

The chart displays the cumulative returns earned over the period 31 January 1989 to 31 July 2005 by being invested in the best quintile portfolio for each of the below mentioned attributes. The quintiles are formed as follows: Share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. The equally weighted market portfolio benchmark is provided as a comparison. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



The complete results of the unadjusted, CAPM and APT risk adjusted tests are displayed in appendices E.5 to E.7. The risk adjusted portfolios, in essence, compare the alpha returns of the attributes to the equal weight benchmark alpha. The trading strategies show the same results even after adjusting returns for market risk and the factor risk using the APT model. The common attributes, for unadjusted and risk adjusted tests, that yield higher returns and lower than market risk are presented in Appendix E.8. The best portfolio for each attribute represents either the highest or the lowest portfolio that delivers the best returns. Size attributes for instance exhibit greater returns in the 'lowest' portfolio as the smallest companies report superior performance. Value, momentum, growth, liquidity and risk portfolio deliver better returns in the 'highest' portfolios.

Exposure to the identified anomalies is increased by dividing each month's share returns into more portfolios which reduces the number of shares in each portfolio. Portfolios range from quintiles (five separate portfolios with an average of 40 shares in each) to 50 portfolios that contain an average of four shares. The same performance measures are used to evaluate the post transaction cost trading strategy for each of these portfolios. Due to numerous permutations, the results for the unadjusted sample for only the 20 portfolios and 40 portfolios strategy are discussed. Table 8.4 shows the results of a strategy hosting 20 portfolios and includes only attributes that show greater returns at lower risk than the benchmark portfolio.

Table 8.4. Results from the Portfolio trading strategy using 20 portfolios

The table displays the annual average return and Sharpe ratio for each attributes' highest and lowest 20 portfolios using unadjusted monthly returns. The same measures for the equally weighted market portfolio (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest returns of the monthly data split into 20 groups. Each month, transaction costs of 1% for 'buying' and 'selling' are applied for newly included and removed shares. Attributes that show higher annual returns at a lower risk than the benchmark are shown in bold. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter Six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Unadjusted Results(20 portfolios)

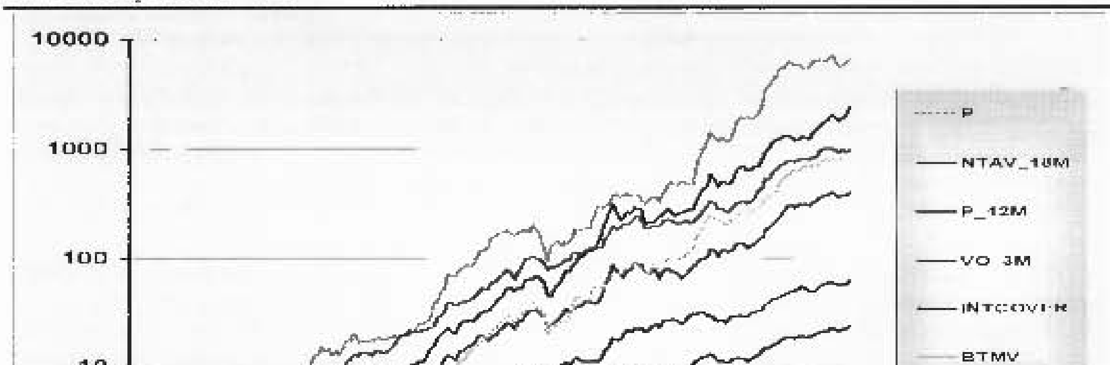
	Highest Portfolio		Lowest Portfolio	
Attribute	Annual Average Return	Sharpe ratio	Annual Average Return	Sharpe ratio
P	0.05%	0.05	**70.17%**	**0.43**
LNCAPS	1.11%	0.04	**59.29%**	**0.43**
NTAV_18M	**48.96%**	**0.46**	-9.28%	-0.05
PNAV_12M	**62.71%**	**0.48**	-4.50%	0.01
NTAV_24M	**44.02%**	**0.43**	0.30%	0.05
LNMV	10.61%	0.22	**62.28%**	**0.42**
P_12M	**65.15%**	**0.51**	11.70%	0.14
VO_3M	**52.74%**	**0.48**	18.62%	0.23
MV	10.61%	0.22	**63.24%**	**0.41**
TV_3M	**39.52%**	**0.45**	19.04%	0.25
PSALES_6M	**48.54%**	**0.45**	-0.40%	0.05
CASHPS	2.86%	0.07	**42.60%**	**0.42**
INTCOVER_BT	**28.26%**	**0.41**	-6.73%	0.00
PNAV_6M	**48.75%**	**0.42**	0.88%	0.06
RI_18M	39.77%	0.36	31.07%	0.25
P_6M	48.91%	0.40	27.48%	0.23
BTMV	**50.09%**	**0.47**	3.07%	0.07
Equal weighted market portfolio	21.85%	0.41	21.85%	0.41

The results are remarkable and show that 17 of the 23 attributes in Table 8.3 deliver even higher returns with lower volatility than a buy and hold strategy. The best portfolio's values are shown in bold. With fewer shares in each portfolio, the difference in returns is accentuated. Trading strategies employing long short techniques would appear to be viable among the anomalous attributes. The most important finding relating to the identified anomalies rests in the values of the Sharpe ratios for each characteristic. Once again, the portfolios demonstrate that while higher returns are obtained, they do not come at the expense of greater risk. This suggests that financial practitioners who tilted their equities towards these anomalous characteristics would have earned substantially higher returns, without the volatility.

Figure 8.2 displays a logarithmic plot of the cumulative returns earned over time by investing in the most profitable of the twenty portfolios. Note the consistency of share returns through both bull and bear markets, with the exception of the 1998 Asian crisis. The attributes are the same as Figure 8.1 and produce higher cumulative returns at less than market risk.

Figure 8.2. Cumulative returns from the Portfolio trading strategy using 20 portfolios

The chart displays the cumulative returns earned over the period 31 January 1989 to 31 July 2005 by being invested in the best of the twenty portfolios for each of the below mentioned attributes. The portfolios are formed as follows: Share returns are sorted monthly according to each attribute and a highest and lowest portfolio is created after splitting the month into twenty groups. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. The benchmark equally weighted market portfolio is provided as a comparison. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



The Sharpe ratios of the Table 8.4 show that equities with anomalous characteristics engender a better reward to risk factor in comparison to the benchmark. Visual inspection of Figure 8.2 may prompt questions to the downside risk of the models. In order to ascertain the magnitude of downswings, the annual average return of "down months" for the market is compared to that of the best portfolios during those months. Over the sixteen and a half year sample period, 60 'down months' (five years) and 138 'up months' (eleven and a half years) are observed. A parametric ANOVA test tests the null hypothesis that the population means of the monthly returns for the market and attribute portfolio are identical. Table 8.5 and 8.6 displays the annual average returns and probability value (p-value) for the 'down' and 'up' months respectively.

Table 8.5. Attribute's returns during 'down' months for the 20's portfolio sort

The table displays the annual average return for the common attributes' best portfolios among the unadjusted sample for 'down' months. The annual average returns for the equally weighted market portfolios (benchmark) are calculated on the bottom row. 'Down' months refer to months in which the benchmark delivered a negative return. The portfolio methodology is discussed in Section 8.2. and the attributes derived from the univariate tests of Chapter Six. The parametric ANOVA test tests the null hypothesis that the population means of the monthly returns for the market and attribute portfolio are identical. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes. The attribute returns greater than the benchmark are highlighted and shown in bold.

Attribute	Best of the 20 Portfolios	
	Annual Average Return	ANOVA Means Test P value
P	-33.67%	0.81
LNCAPS	**-25.13%**	0.48
NTAV_18M	-34.41%	0.73
PNAV_12M	**-27.32%**	0.64
NTAV_24M	**-33.36%**	0.81
LNMV	-38.97%	0.36
P_12M	**-25.14%**	0.54
VO_3M	**-20.18%**	0.23
MV	-38.23%	0.41
TV_3M	**-23.77%**	0.24
PSALES_6M	**-30.66%**	0.89
CASHPS	**-19.60%**	0.13
INTCOVER_BT	**-28.58%**	0.62
PNAV_6M	-31.73%	0.99
RI_18M	-38.72%	0.46
P_6M	**-30.29%**	0.88
BTMV	**-20.02%**	0.20
Equal weighted market portfolio	-31.18%	

Annual returns for the unadjusted equally weighted market portfolio during *down* months amounts to -31.18%. Almost all attribute's annual average returns during *down* months are better than the markets with the exception of price (P), eighteen month momentum (RI_18M), eighteen month change in net tangible asset value (NTAV_18M) and both market value attributes (LNMV and MV). In all cases the null hypothesis for the means test holds, implying that the returns are not different from the benchmark. Both the returns and the ANOVA tests confirm the proposition that anomalous attributes' returns are the same as or better than that of the benchmark during downswings. Table 8.5 below presents the 'up' months.

Table 8.6. Attribute's returns during 'up' months for the 20's portfolio sort

The table displays the annual average return for the common attributes' best portfolios among the unadjusted sample for 'down' months. The annual average returns for the equally weighted market portfolios (benchmark) are calculated on the bottom row. 'Up months refer to months in which the benchmark delivered a positive return. The portfolio methodology is discussed in Section 8.2. and the attributes derived from the univariate tests of Chapter Six. The parametric ANOVA test tests the null hypothesis that the population means of the monthly returns for the market and attribute portfolio are identical. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The attribute returns greater than the benchmark are highlighted and shown in bold.

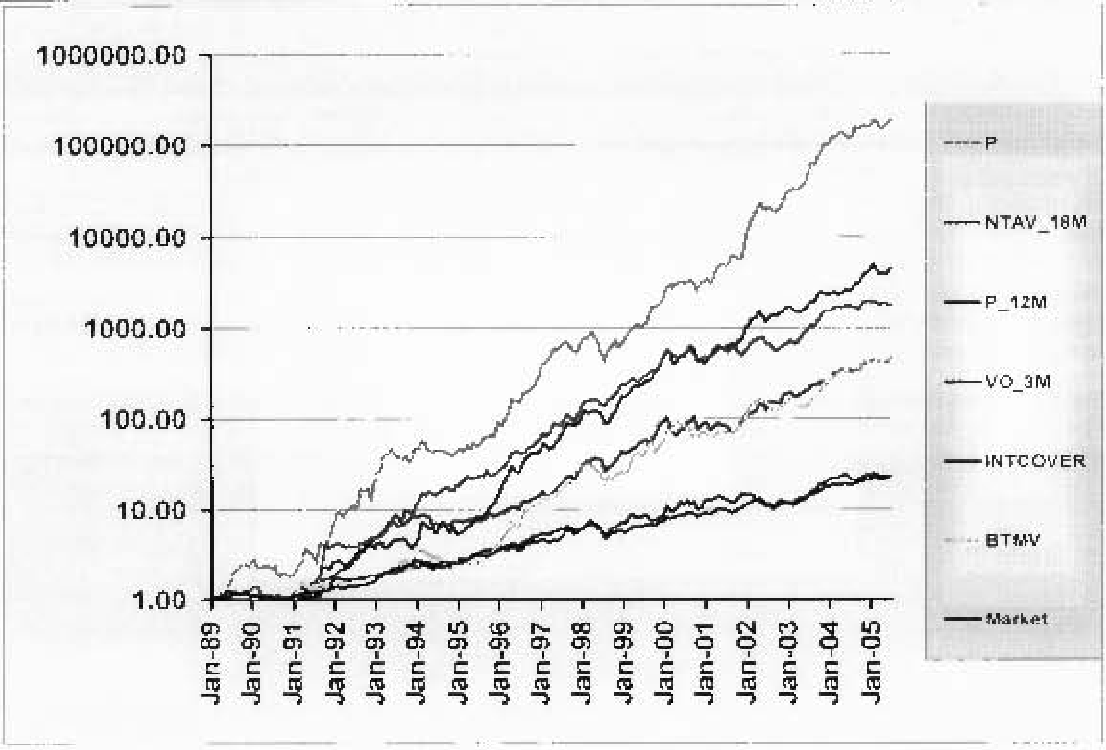
Attribute	Best of the 20 Portfolios	
	Annual Average Return	ANOVA Means Test P value
P	**178.93%**	0.00
LNCAPS	**136.06%**	0.00
NTAV_18M	**121.12%**	0.00
PNAV_12M	**147.40%**	0.00
NTAV_24M	**107.12%**	0.00
LNMV	**169.74%**	0.00
P_12M	**148.65%**	0.00
VO_3M	**110.47%**	0.00
MV	**170.45%**	0.00
TV_3M	**86.35%**	0.01
PSALES_6M	**115.94%**	0.00
CASHPS	**90.44%**	0.01
INTCOVER_BT	**68.21%**	0.15
PNAV_6M	**120.01%**	0.00
RI_18M	**111.92%**	0.00
P_6M	**120.33%**	0.00
BTMV	**105.27%**	0.00
Equal weighted market portfolio	55.26%	

The outperformance of anomalous attributes proves to be considerable during 'up' months. In each case, except for Interest cover before tax (INTCOVER_BT), none of the anomalous attributes show returns similar to the benchmark. Furthermore, the same tests are conducted on trading strategies utilizing 40 portfolios (holding on average 5 shares). The results are the same as those for the 20 portfolios (holding on average 11 shares), and are documented in Appendices E.9 and E.10. The only noticeable differences are that the attributes: MV, LNMV, CASHPS, interest cover before tax (INTCOVER BT), PNAV_6M, RI_18M and P_6M start to lose their return generating strength and exhibit greater volatility.

The tests conducted on the 'up' and 'down' months corroborate the proposition that higher returns have been attainable to investors at a lower than market risk. It appears that anomaly exposure somewhat provides cushioning or limited downside during poorer market months and substantial performance when the equities on average perform well. Table 8.6. presents a summary of firm specific attributes that have historically provided such returns. Figure 8.3 displays the logarithmic plot of the cumulative returns earned over time by investing in the most profitable of the forty portfolios.

Figure 8.3. Cumulative returns from the Portfolio trading strategy using 40 portfolios

The chart displays the cumulative returns earned over the period 31 January 1989 to 31 July 2005 by being invested in the best of the twenty portfolios for each of the below mentioned attributes. The portfolios are formed as follows: Share returns are sorted monthly according to each attribute and a highest and lowest portfolio is created after splitting the month into forty groups. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. The benchmark equally weighted market portfolio is provided as a comparison. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



8.3.2.2. Risk Adjusted Analysis

Table 8.7. Risk adjusted performance evaluation Quintiles

The table displays intercept coefficients, slope coefficients, the corresponding t-statistics and the R square of the regressions of the risk adjusted tests conducted on the long short portfolio. The long short portfolio consists of the highest quintile returns less the lowest one. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. The t-statistics that are significant at their 5% level are in bold. The results provide insight into the persistence of the attributes after removing systematic risk. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	CAPM					APT		
	α	α (t-statistic	β	β (t-statistic)	R Square	α	α (t-statistic)	R Square
P	-0.03	**-8.01**	0.02	0.20	0.00	-0.03	**-8.71**	0.21
LNCAPS	-0.03	**-6.77**	-0.06	-0.57	0.00	-0.03	**-7.26**	0.27
NTAV_18M	0.02	**6.67**	-0.03	-0.42	0.00	0.02	**6.36**	0.08
PNAV_12M	0.02	**4.61**	-0.11	-1.21	0.01	0.02	**4.29**	0.06
EPS	-0.02	**-5.72**	-0.21	**-2.89**	0.04	-0.02	**-5.69**	0.21
POUT	-0.02	**-5.08**	-0.46	**-5.74**	0.14	-0.02	**-5.32**	0.27
NTAV_24M	0.02	**4.60**	0.01	0.07	0.00	0.02	**4.48**	0.10
LNMV	-0.02	**-5.52**	-0.13	-1.32	0.01	-0.02	**-5.81**	0.11
P_12M	0.02	**3.72**	0.00	0.00	0.00	0.02	**3.44**	0.04
VO_3M	0.01	**2.28**	0.04	0.57	0.00	0.01	**2.33**	0.03
MV	-0.02	**-5.49**	-0.13	-1.29	0.01	-0.02	**-5.76**	0.11
TV_3M	0.00	1.57	0.05	0.85	0.00	0.00	1.67	0.01
PNAV_18M	0.01	**2.67**	-0.09	-0.95	0.01	0.01	**2.47**	0.06
PSALES_6M	0.01	**2.30**	-0.16	-1.79	0.02	0.01	1.89	0.10
CASHPS	-0.02	**-6.89**	0.11	1.48	0.01	-0.02	**-7.19**	0.24
INTCOVER_BT	0.02	**6.07**	-0.19	**-2.38**	0.03	0.02	**5.79**	0.18
PSALES_3M	0.01	**2.13**	-0.17	**-1.99**	0.02	0.01	1.77	0.07
PNAV_6M	0.01	**2.59**	-0.10	-1.05	0.01	0.01	**2.17**	0.08
BTMV_18M	0.00	0.86	-0.01	-0.14	0.00	0.00	1.08	0.06
LCPS	-0.02	**-6.42**	-0.25	**-3.21**	0.05	-0.02	**-6.55**	0.19
DEBTNTAV	-0.01	**-3.99**	-0.34	**-4.91**	0.11	-0.01	**-4.35**	0.26
TV_1M	0.00	0.58	-0.04	-0.79	0.00	0.00	0.73	0.03
PNTAV	-0.02	**-4.40**	0.08	0.93	0.00	-0.02	**-5.50**	0.21
RI_18M	0.01	1.70	0.04	0.37	0.00	0.01	1.50	0.05
TLCTA	-0.01	**-2.81**	-0.23	**-4.23**	0.08	-0.01	**-3.16**	0.21
EPS_3M	0.00	1.02	-0.11	-1.69	0.01	0.00	0.89	0.01
NPBT_18M	0.00	1.62	-0.14	**-2.39**	0.03	0.00	1.04	0.10
PTCA	0.00	0.39	0.09	1.00	0.01	0.00	-0.38	0.14
P_6M	0.01	**2.18**	-0.15	-1.37	0.01	0.01	1.75	0.09
BTMV	0.01	**2.01**	-0.22	**-2.47**	0.03	0.01	**2.79**	0.20
CFOPS	-0.02	**-2.12**	-0.21	-0.93	0.00	-0.02	-1.86	0.08
DPS_12M	0.00	1.17	-0.17	**-3.68**	0.07	0.00	0.95	0.20
BORROW_RATIO	-0.01	-1.76	-0.20	**-2.79**	0.04	0.00	-1.66	0.22
DPS_18M	0.00	1.31	-0.16	**-3.00**	0.05	0.00	1.06	0.13
STCL	-0.01	**-3.02**	-0.22	**-3.69**	0.06	-0.01	**-3.04**	0.17
BOR_REPAY_24M	-0.01	**-3.06**	0.08	1.41	0.01	-0.01	**-2.85**	0.04
TDTTA	0.00	-1.62	-0.22	**-3.69**	0.06	0.00	-1.79	0.19
STTD	0.00	-0.05	0.07	1.12	0.01	0.00	0.06	0.29
TV	0.00	-0.72	0.50	**7.68**	0.23	0.00	-0.30	0.35

The risk adjusted tests in Table 8.7 confirm that the returns of the long short portfolio are poorly explained by the conventional asset-pricing models. In the CAPM model, the alpha coefficients are highly positive in most cases. The slope coefficient appears to be significant for only a few attributes, most of which are the weaker anomalous attributes. The APT model proves to provide a better explanation of the share returns, exhibiting higher R square value in comparison to the CAPM. This confirms the supposition that the APT model has better success in returns explanation. The intercept terms, however, remain highly positive and in most cases suggest that abnormal returns are being generated outside the systematic framework.

8.3.2.3. One way stock sort procedure

Table 8.8. One way quintile sorts for Attributes and Attribute Loadings

The table displays the average returns for the highest, lowest and highest minus lowest (HML) portfolios for one way quintile sorts conducted on both attributes and attribute loadings. The t-statistics under the highest minus lowest portfolio relate to the test of whether the time series of returns of the lowest and the highest portfolios are different. The leftmost t-statistic refers to the HML loading returns while the rightmost refers to those of the attribute. The long short portfolio consists of the highest quintile returns less the lowest one. The share returns are sorted monthly according to the attribute and its loading and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. The t statistics that are significant at their 5% level are in bold. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Highest Quintile Returns		Lowest Quintile Returns		[Highest - Lowest Quintile] Returns			
	HML Loading	Attribute	HML Loading	Attribute	HML Loading	t-statistic	Attribute	t-statistic
P	3.03%	0.48%	1.25%	3.36%	1.77%	**2.34**	-2.87%	**4.88**
LNCAPS	2.18%	0.72%	1.58%	3.07%	0.48%	0.63	-2.35%	**4.15**
NTAV_18M	2.32%	2.91%	2.15%	0.27%	0.17%	0.22	2.63%	**4.49**
PNAV_12M	1.30%	2.91%	2.57%	0.65%	-1.26%	1.75	2.26%	**3.60**
EPS	2.30%	0.80%	1.71%	2.15%	0.59%	0.84	-1.35%	**2.88**
POUT	2.39%	0.93%	1.32%	2.33%	1.08%	1.49	-1.40%	**2.74**
NTAV_24M	1.32%	2.61%	2.61%	0.53%	-0.59%	0.57	2.08%	**3.52**
NMV	2.54%	1.14%	1.45%	2.80%	1.39%	1.67	-1.66%	**3.33**
P_12M	2.39%	3.33%	2.34%	1.05%	-0.25%	0.34	2.27%	**3.34**
VO_3M	1.95%	2.46%	2.21%	1.35%	-0.26%	0.37	1.11%	**2.16**
MV	2.83%	1.14%	1.44%	2.98%	1.38%	1.58	-1.84%	**3.31**
TV_3M	1.74%	2.20%	2.23%	1.34%	-0.45%	0.71	0.85%	1.61
PNAV_18M	1.92%	2.54%	2.57%	1.02%	-0.65%	0.58	1.52%	**2.35**
PSALES_6M	1.51%	2.33%	2.31%	1.05%	-0.80%	1.17	1.28%	**2.13**
CASHPS	2.63%	0.76%	1.26%	2.43%	1.38%	1.88	-1.67%	**3.39**
INTCOVER_31	2.27%	2.48%	2.09%	-0.03%	0.18%	0.25	2.49%	**4.46**
PSALES_3M	1.67%	2.39%	2.31%	1.19%	-0.64%	0.91	1.20%	**2.13**
PNAV_6M	1.41%	2.50%	2.45%	1.02%	-1.04%	1.43	1.47%	**2.37**
BTMV_18M	1.80%	2.19%	2.31%	1.40%	-0.51%	0.67	0.78%	1.21
LCPS	2.07%	0.83%	1.49%	2.54%	0.58%	0.75	-1.71%	**3.47**
DEBTNTAV	1.89%	1.10%	1.45%	1.93%	0.44%	0.62	-0.83%	1.08
TV_1M	1.77%	2.05%	2.38%	1.46%	-0.61%	0.85	0.59%	1.25
PNTAV	2.19%	1.06%	1.90%	2.17%	0.29%	0.37	1.11%	**2.08**
RI_18M	2.54%	2.87%	1.94%	1.59%	0.60%	0.78	1.27%	1.82
TLCTA	2.05%	1.30%	2.12%	1.54%	-0.08%	0.11	-0.25%	0.55
EPS_3M	2.22%	1.65%	2.07%	0.95%	0.15%	0.22	0.70%	1.49
NPBT_18M	2.20%	1.99%	2.23%	1.23%	-0.03%	0.05	0.76%	1.34
PTCA	1.89%	2.10%	1.84%	1.44%	0.06%	0.08	0.66%	1.19
P_6M	1.99%	2.87%	2.09%	1.41%	-0.10%	0.13	1.46%	**2.21**
BTMV	1.60%	2.42%	2.49%	1.25%	-0.89%	1.18	1.17%	**2.10**
CFOPS	2.01%	0.85%	2.03%	2.39%	-0.03%	0.04	-1.55%	1.58
DPS_12M	2.05%	1.66%	2.14%	1.05%	-0.09%	0.12	0.61%	1.39
BORROW_RATIO	1.91%	1.42%	1.77%	1.55%	0.14%	0.20	-0.14%	0.28
DPS_18M	1.92%	1.60%	2.45%	0.96%	-0.53%	0.72	0.64%	1.39
STCL	2.14%	1.52%	1.97%	1.90%	0.16%	0.23	-0.38%	0.78
BOR_REPAY_24M	2.50%	1.27%	2.13%	1.57%	0.37%	0.50	-0.31%	0.63
TDTTA	1.45%	1.47%	2.07%	1.47%	-0.62%	0.89	0.00%	0.01
STTD	1.98%	1.70%	2.04%	1.21%	-0.07%	0.08	0.49%	1.06
TV	1.81%	1.55%	2.19%	1.41%	-0.38%	0.52	0.45%	0.90

Table 8.8 displays the one-way sort that ascertains whether the attribute or its loading best explains share returns. Inspection of the loadings reveals that the relationship with share returns is consistent. Size characteristics' highest loadings outperform while the remaining styles' (except for risk) lowest loadings outperform. The attributes themselves display the opposite relationship to their loadings, as mentioned in the returns to risk section. The difference between monthly average returns for each portfolio can also be examined.

The correlations between attributes and their loadings are shown in Appendices E.11 and E.12. The correlations show the persistent inverse relationship and are comparatively more negative over the short term. In all cases, the correlation is weak, which concurs with the results of Daniel and Titman (1997) and van Rensburg and Robinson (2003).

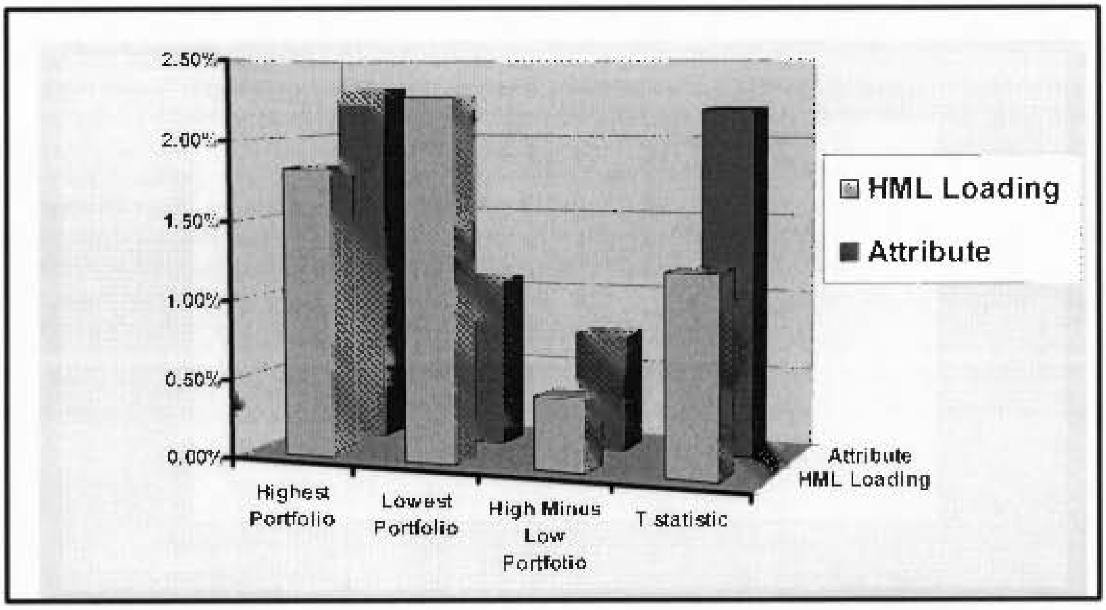
The question of whether the attributes or loadings explain share returns becomes clear on inspection of the t-statistics of the Highest - Lowest (long short) portfolio. The t-statistic next to the high minus low (HML) loading shows that in all cases, except price, the loadings' high and low quintile returns are not different. On the contrary, all the strongest anomalous attributes' t-statistics, shown in the upper half of the table, are significant and suggest that the returns of high and low portfolios are different.

The results are in agreement with Daniel and Titman (1997) and van Rensburg and Robinson (2003), who find no decisive relationship between share returns and loadings can be extracted. Furthermore, the evidence presented in table 8.7, indicates that the attribute itself shows a stronger ability to explain the share returns structure. The inverse relationships, average monthly returns and average t-statistics for the one-way sort can be observed in figure 8.4.

The one-way share sort procedure is also carried out on portfolios consisting of 11 shares (each month is split into 20 portfolios). The results provide a stronger case for the attributes, which are mostly significant and better at explaining share returns. The loadings in all cases are shown to be insignificant. These results can be viewed in Appendices E.13.

Figure 8.4. One-way quintile sorts for Attributes and Attribute Loadings Chart

The chart displays the average returns for the highest, lowest and highest minus lowest (HML) portfolios for one-way quintile sorts conducted on both attributes and attribute loadings. The average t-statistics for the highest minus lowest portfolio is also displayed and is shown as a percentage. The average t statistics relate to the test of whether the time series of returns of the lowest and the highest portfolios are different. The long short portfolio consists of the highest quintile returns less the lowest one. The highest and lowest portfolios in the chart for attributes with inverse relationships are reversed to depict the chart accurately. The share returns are sorted monthly according to the attribute and its loading and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. The data were extracted from DataStream International, available at the University of Cape Town.



8.4. Summary and conclusion

This chapter investigates two important aspects of style-based anomalies among Canadian equities. The first explores the presence of firm specific attributes among three classified sectors or industries. The second examines whether style-based anomalies can be exploited after accounting for transaction costs. Portfolio sorts are also conducted to evaluate whether attributes or their loadings best explain share returns. All tests are conducted using unadjusted, CAPM risk adjusted and APT risk adjusted monthly returns.

The industry specific analysis divides the shares in the entire sample group into three broad sectors or industries, namely Basic materials, Cyclicals and Non-Cyclicals.

Cross sectional regression analysis, employing the same methodologies of Fama and Macbeth (1973) and that used in Chapter Six reveals the following. The most significant attributes found in Chapter Six are commonly prevalent among all three sectors. Risk, value and liquidity based anomalies dominate the Basic Materials shares. Liquidity effects stand out within the Cyclicals group and the Non-Cyclicals sector exhibits Value and Size effects.

The returns to risk portfolio sort assess the viability of trading strategies based on the significant attributes found throughout this study. Portfolios are formed by sorting monthly returns according to the attributes and transactions costs are applied to simulate an active trading strategy. Annual average returns and a Sharpe ratio (mean return divided by the standard deviation) of the portfolios are calculated and weighed up against those of an equally weighted market portfolio. The results confirm the existence of the anomalies and provide evidence that such anomalies are exploitable. The results also suggest that such trading strategies are able to deliver substantially higher returns with lower volatility than a buy and hold approach using the appropriate benchmark. The portfolio sorting tests find that investors are likely to earn even higher returns by selecting shares with the highest anomalous characteristics, without taking up greater risk than the benchmark.

In addition to the returns to risk analysis, risk adjusted portfolio evaluation is carried out using a highest portfolio less lowest portfolio returns set. The alpha coefficients are highly positive for both CAPM and APT models in most cases. This suggests that abnormal returns are being generated outside of traditional asset-pricing models. The APT model proves to provide a better explanation of the share returns, exhibiting higher R square value in comparison to the CAPM, and infers that it is a better model.

The van Rensburg and Robertson (2003) one-way sort methodology, a variation of Daniel and Titman (1997), is employed to establish whether the attributes themselves or the factor loadings on the attributes explain share returns. The results confirm the findings of the two above-mentioned authors and provide evidence that the attributes themselves are better at explaining share returns. The highest and lowest attribute portfolios show significantly different returns and a greater ability to generate abnormal returns.

The evidence uncovered in this chapter is twofold. Shares belonging to certain sectors seem to show a persistence of certain style based anomalies that others do not. Style based anomalies among S&P TSX Composite Index equities have been exploitable after accounting for transaction costs and provide a case for financial practitioners to achieve higher returns at lower risk than appropriate benchmarks.

-9-

Seasonality Analysis

9.1. Introduction

This chapter investigates the nature of seasonality and persistence of calendar effects and their role in the return generation structure of shares.

Empirical research on Canadian seasonality documents two major seasonal tendencies among Canadian equities, namely: The 'Sell in May and go away till November' effect and the calendar month effects in the months of November, December and January (see Chapter Three section 3.6.). The research is somewhat limited to testing hypothesized seasonal time periods and possible seasonality effects for style-based anomalies.

The objective of this chapter is to conduct seasonality analysis using three tests. The first tests six month seasonal periods and finds the most optimal time frame. The second tests calendar month effects and the third aims to find which style-based attributes exhibit seasonal tendencies.

All tests are conducted using unadjusted, CAPM risk adjusted and APT risk adjusted monthly returns.

The remainder of the chapter is set out as follows: Section 9.2 discusses the data and methodologies employed, Section 9.3 reports the results, and Section 9.4 summarises and concludes.

9.2. Data and methodology

"The Stock Exchange world is in a sort of twilight state at the moment. The potential buyers seem to have "sold in May and gone away"... "[4]

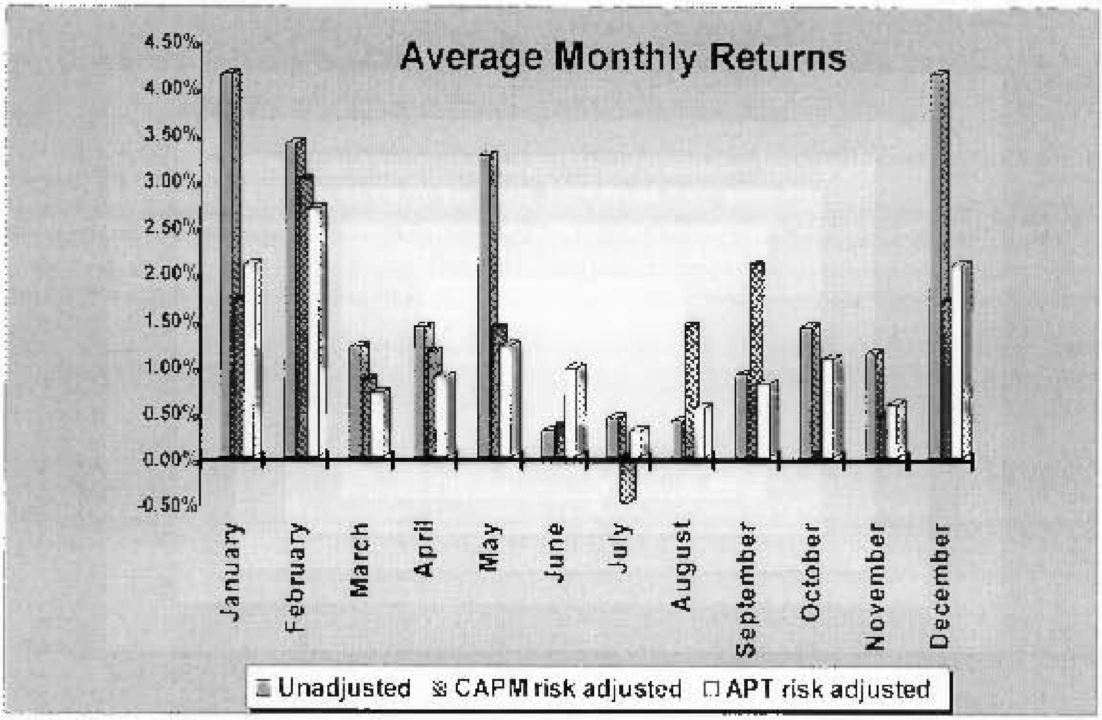
The returns data consists of the unadjusted, CAPM risk adjusted and APT risk adjusted monthly returns of all shares included in the entire data set ranging over the period of 31 January 1989 to 31 July 2005. The monthly payoffs to all the significant attributes as determined during the cross-sectional regressions in Chapter Six are compiled into one list and are used for seasonality assessment. Three sets of seasonal tests are conducted.

The first test sets out to explore the presence of a six month seasonal effect from which the old trading adage, "Sell in May and go away till November" is derived. Visual inspection of the average monthly returns of all securities for each month over the sixteen and a half year sample period provides a case for testing seasonality. Figure 9.1 below displays the average monthly returns of an equally weighted portfolio of all Canadian securities in the sample. The months of December, January, February and May appear to exhibit higher returns than the rest of the months. The risk adjusted monthly returns appear to confirm the presence of such seasonality.

[4] *Financial Times, Saturday, May 30, 1964, page 2*

Figure 9.1 Average Monthly from 31 January 1989 to 31 July 2005

The mean monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 for unadjusted, CAPM risk adjusted and APT risk adjusted samples. The mean monthly return assume an equally weighted market portfolio. The data were extracted from DataStream International, available at the University of Cape Town



Traditionally, the trader's axiom, "Sell in May and go away till November" suggests that shares should only be held for the months November to May. The origin of the axiom is rumoured to be drawn from a similar adage: "Sell in May and come back on St. Leger's day". St Leger's day refers to the date of the classic horse race which dates back to 1776 at Doncaster, England during mid September each year. The staying away till November adaptation was made to fit the observed seasonal patterns of Wall Street. The notion behind these six month seasonal strategies stem from the findings of Bouman and Jacobsen (2002) discussed in Chapter Three.

This study conducts seasonality tests for the "Sell in May and go away till November" effect as well as a "Sell in June and go away till December" based on the observations of figure 9.1. The "Sell in May" strategy is executed by selling the equally weighted market portfolio at the beginning of May (end of April) and buying it back at the beginning of November (end of October). Similarly, the "Sell in June" strategy sells at the start of June (end of April) and buys back on the first of December (end of November). The "Sell in June" methodology is discussed below and is applied to both six month tests.

The "Sell in June" test entails splitting all monthly returns into two portfolios. The first portfolio contains monthly returns for the calendar period December to May. The second portfolio holds the remaining months of June to November. All portfolios in the seasonality tests assume an equal weighted market portfolio, in which the smallest share according to market capitalisation is given the same weighting as the largest. The nonparametric test Kruskal-Wallis H test (will be referred to as KW from here on) and the parametric ANOVA test are used for all seasonality analysis in this chapter. Both KW and ANOVA test the null hypothesis that the population means of the monthly returns for the two portfolios are identical. A description of the KW and ANOVA tests follows after the discussion of the three tests.

The *second* test investigates whether specific months show seasonality. While much of the Canadian seasonality literature has been dedicated to determining the existence of a "January effect", this study examines all the months of the year for both unadjusted and risk adjusted returns. Monthly share returns are divided into twenty four portfolios. Each month has its own portfolio of returns and is matched with a portfolio which contains the share returns of the remaining calendar months in the sample period. The KW and ANOVA tests are conducted to test the null hypothesis that the population means of the monthly returns for the two matched portfolios are the same

The *third* test calculates which of the attributes from Chapter Six display seasonal tendencies using their cross sectional monthly payoffs. For each payoff, two portfolios are formed. The first contains the monthly payoffs generated in the months December to May and the second holds the payoffs for the remaining months of the calendar year. The same methodology as the first and second test is used with a null hypothesis that the population means of the monthly payoffs for the two portfolios are identical.

KW and ANOVA tests

The Kruskal-Wallis H test (developed by Kruskal and Wallis [1952]) tests the hypothesis that independent samples drawn from populations have identical population distributions. The null hypothesis has been adapted to test for mean equality. The means of the monthly calendar returns and payoffs of the two portfolios are used in the three seasonal tests. Rejection of the null hypothesis postulates that the returns or payoffs of the two identified periods are different. This implies that seasonality is prevalent for the specified calendar periods.

For each portfolio, either the monthly returns or payoffs are ranked or each observation is substituted by its rank. The KW H-statistic is calculated as:

$$H = \frac{12}{N(N+1)}\left[\sum_{m=1}^{r}\frac{R_m^2}{n_m}\right] - 3(N+1)$$

where

N = the total number of observations in the complete portfolios data set

R_m = the sum of the ranks in portfolio m

n_m = the number of observations in portfolio m

r = the number of portfolios

Rejection of the null hypothesis requires an H value greater than or equal to the table value of H (upper-tailed rejection region is used). When the null hypothesis holds, the H-statistic is approximated using a chi square (χ^2) distribution with $(r-1)$ degrees of freedom (van den Honert, 1999).

The nonparametric KW test requires less stringent assumptions than the ANOVA tests as it does not require the populations to be normally distributed nor have similar variances.

ANOVA tests are used to examine the null hypothesis that the population means of monthly returns or payoffs for the two portfolios and that the samples (represented by portfolios) are drawn from the same population. The test is based on the idea that if the portfolios have the same mean, then the variability between the sample means (between portfolios) should be the same as the variability within the portfolios.

An F-statistic is calculated using the calendar month portfolios. The ratio of variation between portfolios to the variation within portfolios, and is computed as:

$$F = \frac{MSTR}{MSE}$$

with $$MSTR = \frac{\sum_{m=1}^{12} n_m(\bar{Y}_m - \bar{Y})^2}{12-1}$$

and $$MSE = \frac{\sum_{m=1}^{r}\sum_{i=1}^{n_m}(Y_{i,m} - \bar{Y}_m)^2}{N-r}$$

where

$\bar{Y}_m$ = the mean of the observations in portfolio m

$\bar{Y}$ = the mean of all of the observations

$Y_{i,m}$ = the i^{th} observation in portfolio m

n_m = the number of observations in portfolio m

N = the total number of observations

r = the number of portfolios

The ratio of the variances follows the F-distribution with the numerator and denominator having $(r-1)$ and $(N-r)$ degrees of freedom respectively. If the two variance estimates are equal or similar, the F-statistic should be close to a value of one (van den Honert, 1999). The null hypothesis can be rejected when the variation between the portfolios is significantly larger than the variation within the portfolios.

9.3. Results

In the first test, the "Sell in June and go away till November" six month effect is found to persist. Table 9.1. exhibits the results from the KW and ANOVA tests conducted on the two portfolios which individually hold the share returns for the December to May and the June to November periods.

Table 9.1. Kruskal-Wallis and ANOVA Tests Results for 'Sell in June till November'

The monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 are divided into December to May and the June to November periods and then subjected to the Kruskal and Wallis (1952) and ANOVA tests to assess whether the mean returns of these periods are different from each other. The sample period is from 31 January 1989 to 31 July 2005. The Kruskal-Wallis test-statistic follows a chi-squared distribution, and the ANOVA test-statistic follows an F-distribution. Significant values at the 5% level are shown in bold. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

	Unadjusted returns	CAPM risk adjusted returns	APT risk adjusted returns
F statistic	11.04	10.69	9.77
Chi squared approximation	9.49	9.93	6.20

The results from the KW and ANOVA tests reject the null hypothesis that the means of the monthly returns for the December to May and the June to November samples are identical. This implies that returns within these six month periods show seasonal tendencies, which appear to be exploitable even after risk adjustment. The significance of the seasonality is however somewhat reduced after accounting for systematic risk.

Table 9.2 Kruskal-Wallis and ANOVA Tests Results for 'Sell in May till October'

The monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 are divided into November to April and the May to October periods and then subjected to the Kruskal and Wallis (1952) and ANOVA tests to assess whether the mean returns of these periods are different from each other. The sample period is from 31 January 1989 to 31 July 2005. The Kruskal-Wallis test-statistic follows a chi-squared distribution, and the ANOVA test-statistic follows an F-distribution. Significant values at the 5% level are shown in bold. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

	Unadjusted returns	CAPM risk adjusted returns	APT risk adjusted returns
F statistic	3.79	4.52	5.61
Chi squared approximation	3.06	4.63	5.65

The KW and ANOVA tests are additionally used to test the "Sell in May and go away till November" strategy. The results are shown in Table 9.2. above.

The findings agree concur with Athanassakos (2005) and Bouman and Jacobsen (2002) who both find exploitable seasonality among Canadian equities during the two six month periods. This confirms the trading adage, "Sell in May and come back in November". The results are significant, albeit weaker, than the "Sell in June" strategy. The findings of this study therefore propose that seasonality is best exploited using a strategy that acquires equity securities at the beginning of December, sells in late June and remains invested in risk-free instruments for the remaining six months.

The mean monthly returns for the two portfolios are displayed in Figure 9.2 and Figure 9.3. The December to May months appear to have more positive periods in comparison to the June to November months. Moreover, months that exhibit negative returns show smaller magnitude declines during the 'better' six month period.

Figure 9.2 Mean Monthly Returns for the December to May period

The mean monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 are divided into December to May and the June to November periods. The mean monthly return are taken from the unadjusted returns sample and assume an equally weighted market portfolio. The sample period is from 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town

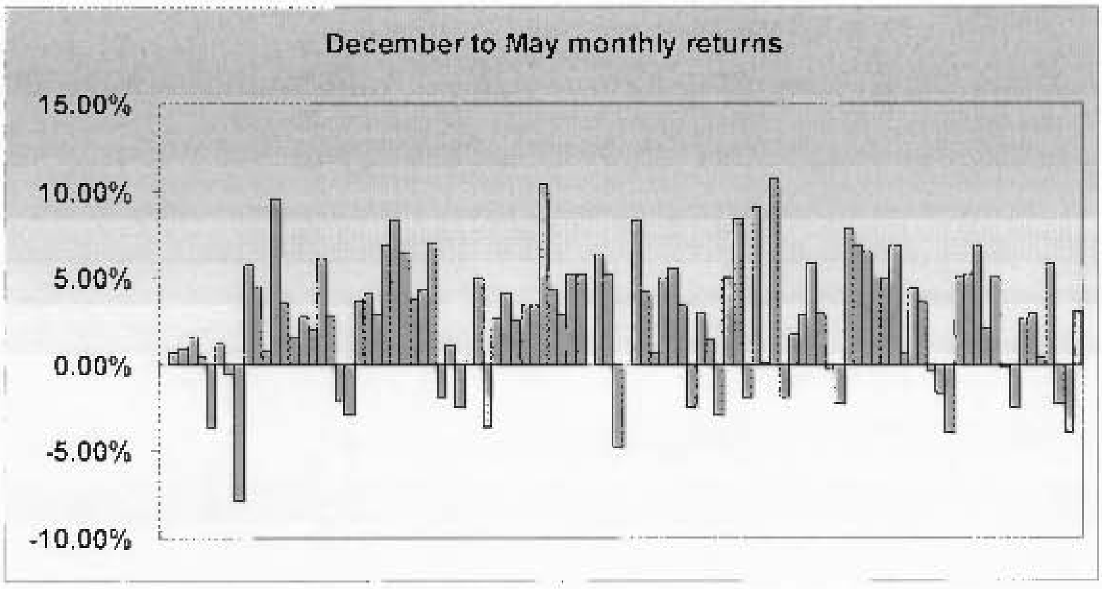
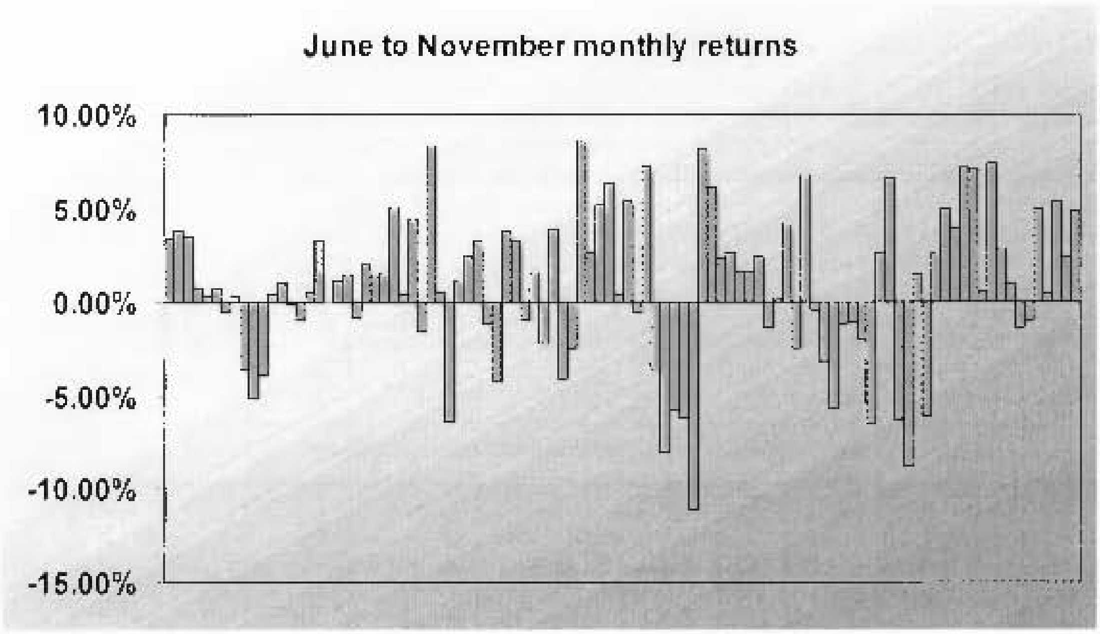


Figure 9.3 Mean Monthly Returns for the November to April period

The mean monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 are divided into November to April and the May to October periods. The mean monthly return are taken from the unadjusted returns sample and assume an equally weighted market portfolio. The sample period is from 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town



The second test investigates the persistence of seasonality in specific calendar months. Anomalous months such January, which have historically generated abnormal returns, are often cited amongst empirical researchers. The KW and ANOVA tests are conducted for all the months of the year and the results are displayed in Table 9.3.

Table 9.3. Kruskal-Wallis and ANOVA Tests Results for Calendar months

The monthly returns on all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005 are divided into their respective calendar months. Each month has a matching portfolio containing all the other months returns. Each months' returns and its matching portfolio are subjected to the Kruskal and Wallis (1952) and ANOVA tests to assess whether the mean returns are different from each other. The sample period is from 31 January 1989 to 31 July 2005. The Kruskal-Wallis test-statistic follows a chi-squared distribution, and the ANOVA test statistic follows an F distribution. Months displaying significant seasonality at the 5% level are displayed in bold. The data were extracted from DataStream International, available at the University of Cape Town Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

	Unadjusted returns		CAPM risk adjusted returns		APT risk adjusted returns	
	F statistic	Chi square value	F statistic	Chi square value	F statistic	Chi square value
January	**8.54**	**7.97**	**4.11**	**2.75**	**7.31**	**3.99**
February	**6.09**	**4.34**	**12.66**	**10.15**	**9.67**	**10.37**
March	0.40	0.05	0.14	0.36	1.34	1.41
April	0.22	0.50	0.64	0.96	0.99	0.29
May	**11.29**	**8.88**	1.36	0.77	3.08	2.68
June	0.00	0.25	0.07	0.00	2.99	3.03
July	0.04	0.02	**4.56**	**4.94**	0.02	0.37
August	0.02	0.11	3.57	2.24	0.60	1.18
September	0.18	0.45	**6.99**	**5.25**	1.95	2.04
October	0.38	0.01	0.47	0.24	3.74	3.69
November	0.16	0.46	0.03	0.00	0.26	1.28
December	**12.98**	**10.02**	**4.17**	**3.84**	**16.38**	**10.26**

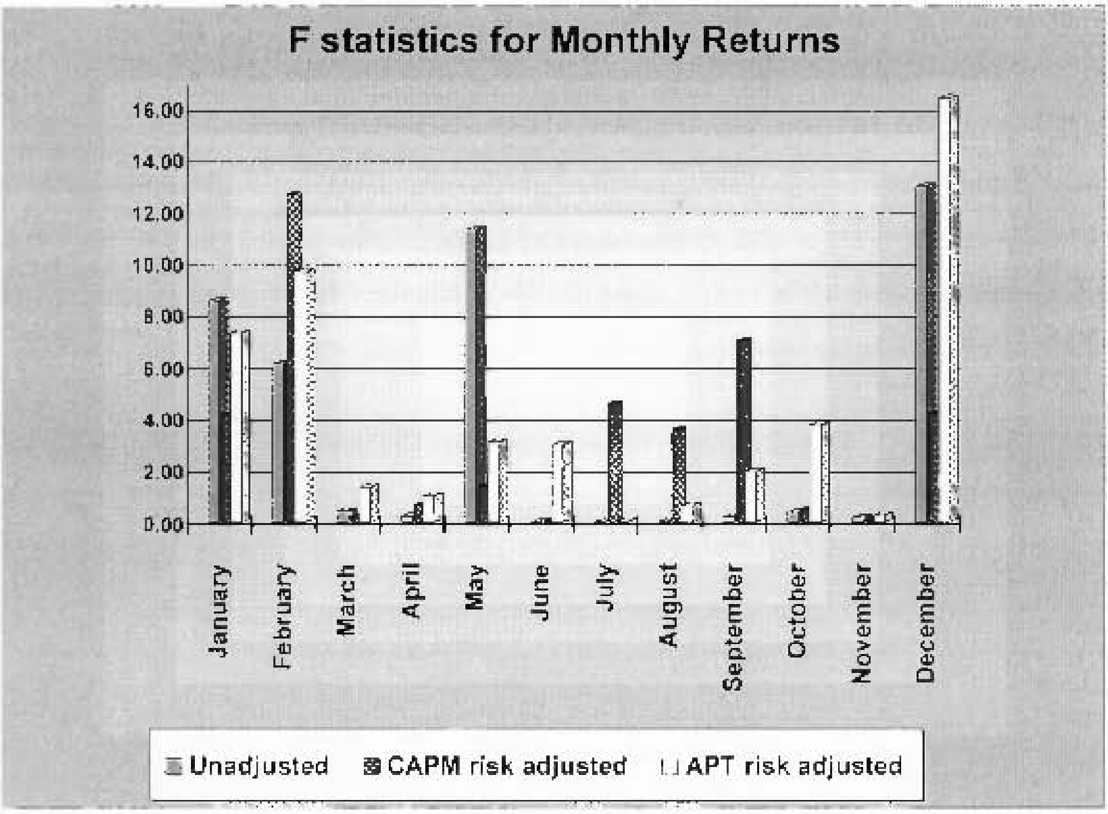
The unadjusted and risk adjusted samples mutually present evidence for the existence of a January, February and December effect. Both the ANOVA and KW tests confirm these calendar month effects for the sample period. The unadjusted sample displays a May effect and the CAPM sample shows a July and September calendar month effect.

The results agree with the findings of a January effect by Tinic, Barone Adesi and West (1987) and Athanassakos (2002) and (2005). Tinic et al note that thinly traded Canadian shares have historically generated abnormal returns during the month of January. Athanassakos (2002) postulates that risky securities, with high betas and low bond ratings, have a more pronounced January effect. Their excess returns for the remainder of the year however tend to be lower. Similarly, Athanassakos (2005), in a study spanning over 47 years, finds that small companies commanded high excess returns during the Northern hemisphere winter months than during the summer. His findings further identifies the months of November, December and January as the strongest of the year.

The results of the calendar month tests are of the same view as Athanassakos (2005) and confirm the existence of a January, February and December calendar month effect over the sixteen and a half year sample period. These monthly effects concur with the first test's findings that Canadian winter months are more prone to excess returns than the summer. The three significant individual months also fall into the best six month period, December to June. Figure 9.4 presents the F statistics from the calendar month tests.

Figure 9.4. F statistics for Calendar months of the year

The F statistics from the parametric ANOVA tests conducted on the monthly returns of all calendar months for all Canadian equities that make up the S&P TSX Composite Index at 31 July 2005. The chart shows the F statistics for unadjusted, CAPM risk adjusted and APT risk adjusted samples. The tests assume an equally weighted market portfolio. The data were extracted from DataStream International, available at the University of Cape Town



The third and final seasonal test determines which attributes show any seasonal tendencies in the two periods December to May and the June to November. Table 9.4 displays the results from the KW and ANOVA tests.

Table 9.4. Results of the Kruskal-Wallis and ANOVA Tests for Seasonality among payoffs

The payoffs to attributes are divided into December to May and the June to November periods and then subjected to the Kruskal and Wallis (1952) and ANOVA tests to assess whether the mean payoffs of these periods are different from each other. The Kruskal Wallis test-statistic follows a chi-squared distribution, and the ANOVA test-statistic follows an F-distribution. The time series of payoffs are extracted from the univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005 for each attribute. The data were extracted from DataStream International, available at the University of Cape Town. Characteristics displaying significant seasonality at the 5% level are displayed in bold. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Seasonality of payoffs			
Attribute	Grouping	Unadjusted returns	
		F statistic	Chi square approximation
P	Size	**4.2283**	**4.3799**
LNCAPS	Size	0.1829	0.3424
NTAV_18M	Value	0.0058	0.0378
PNAV_12M	Value	0.0591	0.7040
EPS	Size	2.1414	1.2170
POUT	Growth	**7.0961**	**4.7929**
NTAV_24M	Value	0.8027	0.9875
LNMV	Size	**5.8331**	**8.0334**
P_12M	Momentum	1.2266	2.1187
VO_3M	Liquidity	0.4139	3.1365
MV	Size	**8.9901**	**7.8749**
TV_3M	Liquidity	**5.0924**	**4.3924**
PNAV_18M	Value	1.0837	2.3691
PSALES_6M	Value	0.9328	2.1309
CASHPS	Size	0.0013	2.4530
INTCOVER_BT	Risk	2.6772	2.1636
PSALES_3M	Value	0.1101	1.2037
PNAV_6M	Value	0.7193	1.0473
BTMV_18M	Value	3.4728	**5.7479**
LCPS	Size	0.1193	1.5081
DEBTNTAV	Risk	0.0234	0.1025
TV_1M	Liquidity	2.9207	1.9329
PNTAV	Value	2.9370	3.4302
RI_18M	Momentum	1.5942	1.9572
TLCTA	Risk	0.2055	0.2155
EPS_3M	Growth	2.0570	1.5800
NPBT_18M	Growth	0.1379	0.4368
PTCA	Value	0.4502	1.1979
P_6M	Momentum	0.8376	1.0741
BTMV	Value	2.1300	1.2414
CFOPS	Size	0.2818	0.8702
DPS_12M	Growth	0.0028	0.2990
BORROW_RATIO	Risk	0.0355	0.0874
DPS_18M	Growth	0.3199	0.9490
STCL	Risk	0.4676	0.0749
BOR_REPAY_24M	Growth	0.5621	1.4573
TDTTA	Risk	0.9101	0.2021
STTD	Risk	0.0932	0.0000
TV	Liquidity	0.3049	0.3852

Three size related attributes: price (P), natural logarithm of market value (LNMV) and market value (MV) show stronger returns during December to May that are statistically different to those of the June to November period. The payout ratio (POUT), one month change in trading volume ratio (TV_3M) and eighteen month change in book to market value (BTMV_18M) also exhibit the same seasonal pattern. Only these attributes are found to show significant abnormal seasonal returns outside of the general monthly variation of the market.

Both the ANOVA and Kruskal-Wallis tests assume independence of payoffs between and within portfolios. The autocorrelation tests conducted in Chapter Seven, Section 7.3. finds extensive autocorrelation for the attributes P, LNMV and MV. This violates the independence assumption and accordingly the seasonality of these attributes' payoffs should be disregarded. The remaining attributes POUT, TV_3M and BTMV_18M, seem capable of producing some noteworthy seasonal returns.

9.4. Summary and conclusion

This chapter investigates the nature of seasonality and persistence of calendar effects and their role in the return generation structure of shares.

Seasonality appears to be persistent throughout Canadian equity returns. The parametric ANOVA tests and nonparametric Kruskal Wallis H test (1952) tests are used for all seasonality assessment. The commonly known adage "Sell in May and go away till November" seems to hold truth for Canada. However, an adapted "Sell in June and go away till December" effect however has better results.

The calendar month tests indicate that January, February and December are the strongest months of the year. The findings partially support those of Athanassakos (2005) who identifies the months of November, December and January as the strongest. The findings of this study confirm the *January effect,* and are in agreement with Tinic, Barone Adesi and West (1987) and Athanassakos (2002) and (2005).

Finally, only six attributes' payoffs display returns that are different during the December to May and June to November periods. Three are size related attributes (P, LNMV and MV) and others are POUT, TV_1M and BTMV_18M. First order autocorrelation for P, POUT, LNMV and MV (see Chapter Seven, section 7.3.1) violates the independence assumptions of the ANOVA and Kruskal Wallis H tests, and the seasonality of their payoffs should be disregarded.

The evidence uncovered in this chapter suggests that seasonal tendencies in the return structure of shares appear to exist for Canadian returns of the S&P TSX Composite Index. The most notable patterns are the two six month periods of the year and three individual calendar months.

-10-

Summary and Conclusion

10.1. Summary of results

Exploratory Analysis

The 221 Canadian equities chosen in this study are the constituents of the S&P TSX Composite Index as of the 31 July 2005. The inclusion criteria for member firms of the Index negate the likelihood of thin trading and arguably the weak form of market efficiency. The data set includes share returns and 904 firm specific attributes which are obtained or constructed using accounting, financial, volume or technical values, for the 31 January 1989 to 31 July 2005 sample period. The sheer size of the dataset makes this thesis the largest anomaly study to date of the Composite Index. An *in* sample period of 31 January 1989 to 31 December 2000 and *out* sample period ranging from 31 January 2001 to 31 July 2005 is selected. Both returns and attributes data sets are winsorised using a two step process which effectively removes outliers from the sample. Data considerations include the varying reporting standards and accounting policies that have evolved significantly over the near 17 year period, and the survivorship bias that is prevalent throughout this study.

The Toronto stock exchange is the 8th largest in the world and consists of a broad variety of securities from different market sectors. The returns of Canadian equities are highly correlated to their United States counterparts. Cluster and factor analysis on both S&P and DataStream International indices suggest that the sectors that explain most of the variation on the S&P TSX Composite Index are: (1) Energy (Oil and natural gas); (2) Information Technology; (3) Mining; (4) Retailing and (5) Engineering. These indices provide economic rationale for the behaviour of returns on the Toronto Stock Exchange as Canada has an abundance of Oil and resource related firms, a buoyant manufacturing segment and well endorsed IT industry.

The multifactor structure of S&P TSX Composite Index returns is confirmed using scree plot eigenvalues under the extraction rule of Cattel and Jaspars (1967). For both S&P and DataStream International indices, four factors are extracted. The factors cumulatively explain 86% and 89% of the variation respectively.

APT model for both the S&P and DataStream International indices are constructed using the four indices most closely associated with each of the factors. A single-index model using the market index is also constructed. The APT models for both the S&P and DataStream International data sets perform better as they display a higher average R^2 and adjusted R^2-adjusted values for more companies than the Single-index model. In the same light, the APT models explain significant amounts of variation among the residuals of the single-index model. *In* and *out* sample tests point to the possibility of non-stationarity and the models appear to lose explanatory power over time. The CAPM and APT derived from S&P data is selected for risk adjustment procedures.

Univariate and Multivariate tests

The Univariate cross sectional regressions following the methodology of Fama and Macbeth (1973) yield 211 statistically significant firm specific attributes. The coefficients of all 904 of attributes, of which some are highly correlated, are subjected to a correlation filter using the Pearson (1896) product moment correlation statistic. The filter reduces the significant attribute list down by 175 to 36. This final list of significant attributes is classified according to six style interpretation groups, namely: (1) size, (2) liquidity, (3) growth, (4) momentum, (5) value and (6) risk. Cluster analysis performed on attribute payoffs finds some commonality in how the various style based effects group together. The inconsistency between *in* and *out* sample period anomaly results casts doubt their persistence and questions whether they are perhaps perennial in nature.

A number of attributes from all style groups make up the final uncorrelated list and represent anomalous style effects. Size, value and growth effects appear to be the most prominent. Some of the attributes previously found to be associated with abnormal returns such as price to sales, price to earnings, book to market, momentum and earnings momentum ratios are found to be either insignificant or less significant after risk adjusted returns are tested. The most significant attributes identified by the univariate studies exhibit greater style consistency.

Multivariate cross sectional regression analysis suggests the persistence of size and value effects within all unadjusted and risk adjusted samples. The analysis indicates that unadjusted and risk adjusted returns are best explained by the following attributes: Price (P), natural log of current assets per share (LNCAPS), twelve month change in price to net asset value (PNAV_12M), eighteen month change in net tangible asset value (NTAV_18M), one month change in trading volume (TV_1M) and the payout ratio (POUT).

Style Timing

Several attributes do show significant autocorrelation for up to three lags which thereafter dissipates. The more pervasive autocorrelation amon g certain attributes such as cash per share (CASHPS), and eighteen month change in net tangible asset value (NTAV_18M), is likely to be a result of their construction process which uses fairly rigid accounting values. Payoffs are shown to be stationary after unit root testing.

The six month moving average model is unanimously the best, followed by the twelve month moving average and eighteen month moving average. The historic mean, one month model (which uses the previous month's payoff) and the twelve-lag autoregressive model show the weakest results. Certain attributes exhibit a greater direction bias than the other. The trading strategy based on accumulating securities when the payoff direction deviates from its biased direction is postulated to provide similar, and arguably better long term results in comparison to the six month moving average model.

Portfolio Sorting and industry specific analysis

Industry specific analysis splits shares into three broad sectors or industries, namely: *Basic materials, Cyclicals and Non-Cyclicals*. The most significant attributes found in the univariate tests are commonly prevalent among all three sectors. Risk, value and liquidity based anomalies dominate the Basic Materials shares. Liquidity effects stand out within the Cyclicals group and the Non-Cyclicals sectors exhibit value and size effects.

The returns to risk portfolio sort evaluates the viability of trading strategies based on the significant attributes found throughout this study. The results confirm the existence of anomalies and show that such anomalies have been exploitable after transaction costs. Portfolios skewed towards anomalies deliver substantially higher returns with lower volatility than buying and holding an equally weighted market portfolio. In most cases downside risk of these portfolios are equal to the market while the upside is considerably superior to the market. Risk adjusted portfolio evaluation suggests that anomaly returns are alpha driven and beyond those of CAPM and APT.

The van Rensburg and Robertson (2003) one-way sort methodology determines whether the attributes themselves or the factor loadings on the attributes explain share returns. The attributes themselves are better at explaining share returns. A long short portfolio based on anomalous attributes generates greater abnormal returns.

Seasonality

Strategies based on the adage: "Sell in May and go away till November" hold for Canada and would have generated excess returns. An adapted "Sell in June and go away till December" is more statistically significant and provides better returns. The calendar month tests yield January, February and December as the strongest months of the year. The payoffs of attributes show vague seasonal tendencies.

10.2. Final conclusion

This thesis has set out to provide a better understanding of the return generation structure of the Toronto Stock Exchange. Contrary to documented Canadian asset-pricing evidence, the market model and four factor APT show an impressive ability to explain the bulk of share returns.

Style anomalies are uncovered amongst shares of the TSX using comprehensive univariate cross sectional and consistency testing, before and after CAPM and APT risk adjustment. Multivariate cross sectional tests find, on average, that four style anomalies are best combined to explain excess returns. The monthly payoffs of all anomalies are best timed with the use of a six month moving average style timing model.

The style anomalies are found to vary in strength and consistency, but overall appear to be exploitable. This is supported by portfolio sorting tests that generate considerable returns after transactions costs, when shares are selected based on their firm specific characteristics. Greater abnormal returns seem to be attainable by aggressively tilting asset exposure towards shares that exhibit anomalous traits. The evidence in this thesis, within the realms of its limitations, provides a persuasive case for anomaly existence and the ability to achieve superior returns.

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Appendix A

A.1. Definitions of DataStream International Items

Definitions of DataStream International items used to construct the firm-specific attributes tested in this paper. The DataStream International code is listed in brackets after the item. The definitions are based on the DataStream International online definitions.

DataStream International Definitions

Amortisation of Intangibles (975)

The non-movement of funds as shown in the Cashflow / Sources and Uses Statement and relating to the intangible assets.

Assets Index (AI)

The assets index is calculated by expressing each latest year-end net tangible asset per share as a percentage of the net tangible asset per share obtained from the first accounts, adjusted for capital factors. For sectors, total net tangible assets is used.

Assets per Share (APSH)

A company accounts item. This is also referred to as the book value or net tangible assets per share. This is defined as net tangible assets (shareholder's equity minus intangibles) divided by the year-end number of shares. For reduced formats countries and Worldscope sourced emerging markets, intangibles have not been deducted from shareholder's equity. It is calculated from company account items 305 (shareholder's equity) and 344 (intangible assets).

Book Value per Share (1308)

Calculated on an issue basis, using that portion of share capital and reserves (excluding preference capital) minus intangibles attributable to the issue, divided by the year-end number of shares in that issue. It is adjusted for subsequent rights and scrip issues.

Borrowing Ratio (733)

Total debt divided by equity capital and reserves minus total intangibles.

Borrowings Repayable Within 1 Year **(309)**

Bank overdrafts, loans and other short-term borrowing. The current portion of long-term loans is included.

Capital Gearing **(731)**

Preference capital plus total debt, divided by total capital employed plus short term borrowings minus total intangibles minus future income tax benefits.

Capital Ratio **(772)**

Total share capital and reserves plus minority interests less intangible assets divided by total creditors and equivalent plus borrowings repayable in less than 1 year and provisions for liabilities in less than 1 year. (%)

Cash Earnings per Share **(792)**

Earned for ordinary plus deferred tax and operating provisions, divided by the number of shares in issue.

Cash Flow Margin **(719)**

Cash earnings as a percentage of sales.

Change in Cash and Equivalent **(450)**

This shows the increase or decrease in cash, bank balances, short-term loans, deposits and short-term investments.

Depreciation **(136)**

This includes provisions for amounts written off, and depreciation of tangible fixed assets. Amortisation of intangible assets is included only if a separate breakdown is not disclosed in the annual report.

Discount Par **(DISP)**

This value represents the percentage discount of the current share price to its net asset value at par. The bigger the negative, the bigger the discount. A positive value implies a premium.

Dividend Cover **(DCV)**

The dividend cover is the maximum dividend that a company could pay out of earnings divided by the actual dividend paid.

Dividend Yield **(DY)**

The dividend per share as a percentage of the share price. The underlying dividend is based on an anticipated annual dividend over the following twelve months and for that reason may be calculated on a rolling twelve-month basis, or as the "indicated" annual amount, or it may be a forecast. The dividend yield is based on gross dividends (including tax credits) where available. Special or once-off dividends are generally excluded.

Dividends Paid **(434)**

Ordinary and preference dividends paid during the period, often representing the previous year's final and current year's interim dividends.

Dividends per Share **(DPS)**

Dividend per share on a twelve-month rolling basis, taking interim dividends into account.

Earnings per Share **(EPS)**

The latest annualised rate that may reflect the last financial year or be derived from an aggregation of interim period earnings. Where the interim announcements are irregular or lacking in detail, the current earnings per share (EPS) may be a forecast provided by local sources.

Equity Capital and Reserves **(305)**

The equity share capital and reserves of the company. Preference capital is not included.

Standard adjustments include:

- goodwill shown against reserves is transferred to total intangibles
- capital and other grants shown as deferred liabilities are transferred to reserves
- proposed dividends are deducted if the balance sheet is shown before appropriations
- hybrid capital and other non-equity capital may have been excluded

Free Resources Ratio **(774)**

Total share capital and reserves plus minority interests plus total loan capital less tangible fixed assets, intangible assets ,investments and other non-current assets divided by total creditors and equivalent plus borrowings repayable in less than 1 year plus provisions for liabilities less than 1 year. (%)

Gross profit on sales **(603)**

Total sales less cost of sales.

Historical 5 Year Growth **(YR5GTH)**

Historical five year growth. The rate of change in reported earnings per share over the five year time intervals terminating on the date of the last fiscal period for which EPS have been announced

Industry Classification **(INDC)**

DataStream classifies each company by industry (that is, its primary activity only). Equities with the same industrial classification are grouped into sectors. DataStream industrial classifications exist at three levels:

Level 1	Market Data
Level 2	Non-Financials Non-Financials excluding Resources Resources Financials
Level 3	Basic Industries Cyclical Consumer Goods Cyclical Services General Industrials Information Technology Non-cyclical Consumer Goods Non-cyclical Services Resources Financials Utilities

Interest Cover Before Tax (ICBT)

Earnings before interest and tax (adjusted operating profit plus total non-operating income) divided by interest paid.

Market Value (MV)

The share price multiplied by the number of ordinary shares in issue. The amount in issue is updated whenever new tranches of stock are issued or after a capital change. For companies with more than one class of equity capital, the market value is expressed according to the individual issue. Market value is displayed in millions of units of local currency.

Market Value to Book Value (MTBV)

The market value to book value (also called discount to net asset value) divides the market value by the net book value.

Net cashflow (1048)

Changes in net cash before the impact of exchange adjustments and reflects cash inflow after financing.

Net Profit Margin (717)

Profits after tax (adjusted) divided by total sales.

Number of Shares (NS)

The number of shares used in the calculation of earnings per share. The year-end number of shares is used.

Number of Trades **(NT)**

This is the total number of times shares were traded in the day, as recorded by SEAQ (the London Stock Exchange Automated Quotation system).

Operating Profit Margin **(713)**

Operating profit (adjusted for exceptional items) divided by total sales.

Payout Ratio **(POUT)**

The ratio of dividends per share to the net earnings per share (adjusted) for the last financial period.

Price **(P)**

The latest price available to DataStream International from the appropriate market in primary units of currency. It is the previous day's closing price from the default exchange. The 'current' prices taken at the close of market are stored each day. These stored prices are adjusted for subsequent capital actions, and this adjusted figure then becomes the default price. Prices are generally based on 'last trade' or an official price fixing. For stocks which are listed on more than one exchange within the country, default prices are taken from the primary exchange of that country (note that this is not necessarily the 'home' exchange of the stock).

Pre-tax profit margin (%) **(716)**

Pre-tax profit (excluding associates) divided by total sales. (%)

Pre-tax profits **(154)**

The pre-tax profit for the financial period as reported by the company. This includes any dividends received from associated companies.

Price/Cashflow Ratio **(PC)**

Current price divided by cash earnings per share for the appropriate financial year, adjusted for capital changes.

Price/Earnings ratio **(PE)**

This is the price divided by the earnings rate per share at the required date.

Price to Book **(PTBV)**

This is the price dividend by the book value or net tangible assets per share for the appropriate financial year end, adjusted for capital changes.

Quick Assets Ratio **(742)**

Total current assets minus total stock and work in progress, divided by total current liabilities.

Research and Development **(119)**

This figure includes regular write-offs to the profit and loss account of research and development capitalised in the balance sheet. Also included are disclosed amounts of expenditure in the year which are not capitalised.

Return Index **(RI)**

Theoretical growth in value of a share holding over a specified period, assuming that dividends are re-invested to purchase additional units of an equity at the closing price applicable on the ex-dividend date.

Return on Capital Employed **(707)**

Pre-tax profit (excluding associates) adjusted for exceptional items plus total interest charges, divided by total capital employed plus borrowings repayable within one year minus total intangibles.

Return on shareholders equity (%) **(701)**

Adjusted Earned for Ordinary divided by Equity capital and reserves less intangibles plus deferred tax. (%)

Return on Equity (Published) **(1506)**

Earned for ordinary, divided by equity capital and reserves minus total intangibles.

Return on capital employed (%) **(707)**

Earnings before interest and tax divided by total capital employed plus short term borrowings minus total intangibles.

Total Assets **(392)**

The sum of tangible fixed assets, intangible assets, investments (including associates), other assets, total stocks & work in progress, total debtors & equivalent and cash & cash equivalents.

Common adjustments:

- deferred tax, if shown as an asset, is offset against deferred tax liability
- goodwill carried in reserves is transferred to intangible assets
- advances on work in progress, if disclosed as a liability by the company, has been offset against stocks and work in progress

Total Cash and Equivalent **(375)**

For industrials, this includes cash, bank balances, short-term loans and deposits, and investments shown under current assets. For banks and finance companies, it includes cash and balances with other banks, money at call and short notice, treasury bills and term deposits maturing under one month. Placements with banks are excluded.

Total Current Assets **(376)**

Includes stocks, work in progress, trade and other debtors, cash and equivalent, and any other current assets. Trade accounts receivable after one year are included.

Total Current Liabilities **(389)**

Includes current provisions, trade and other creditors, borrowings repayable within one year, and any other current liabilities. Trade accounts payable after one year are included. Where the balance sheet is stated before profit appropriation, the as reported figure for current liabilities is increased by the amount of proposed dividends outstanding at balance sheet date.

Total Debt **(1301)**

The total of all long and short term borrowings, including any subordinate debt and 'debt-like' hybrid finance instruments.

Total Debtors and Equivalent **(370)**

The total of balances outstanding which are due to the organisation in the normal course of trading. Accounts receivable after one year are included in this item.

Total Intangibles **(344)**

This includes research and development, goodwill, patents, trade marks, deferred charges, formation expenses and concessions. The figure may differ from that reported due to the fact that deferred charges may have been shown as part of 'other assets' and goodwill on acquisition may have been deducted from share capital and reserves.

Total Loan Capital **(321)**

The total loan capital repayable after one year. It includes debentures, bonds, convertibles, notes, leasing finance, and 'debt-like' hybrid financial instruments.

Total Number of Employees **(219)**

The average number of employees as disclosed by the company. The year end number is used if the average number is not disclosed

Total Sales **(104)**

The amount of sales of goods and services to third parties relating to the normal industrial activities of the company. It is net of sales related taxes and excludes any royalty income, rental income, and other operating income.

Total Stock and Work In Progress **(364)**

This includes finished goods, raw materials, work in progress less any advances paid, and any other stocks. It is stated net of any provisions for obsolete stocks. The most common adjustment applied to the as disclosed figure is the inclusion of advances on work in progress if shown as a liability.

Turnover by Volume (VO)

The number of shares traded for a stock for a particular month. The figure is always expressed in thousands. For stocks which are traded on more than one exchange within the country, default volumes are taken from the primary exchange of that country (note that this is not necessarily the 'home' exchange of the stock).

Working Capital Ratio (741)

Total current assets divided by total current liabilities.

A.2. Construction of Firm-specific Attributes from DataStream International Data

The table shows the construction of the firm-specific attributes using data from DataStream International, available at the University of Cape Town. Some attributes are taken directly from DataStream International. Characteristics while other are constructed. The definitions of the attributes' components are included in Appendix A.1.

A_TURN	[Total Sales] / [Total Assets]
APC	[Price] / [Cash Earnings per share]
APSH	[total assets / number of shares]
BETA	Beta
BORROW_RATIO	[Total Loan Capital] / ([Total Equity Capital and Reserves] - [Total Intangibles])
BTMV	1 / [Market to Book Value]
CAP_GEARING	[Capital Gearing Ratio]
CAPS	[Current Assets] / [Number of Shares]
CASH_EPS	[Cash Earnings] / [Number of Shares]
CASHDIVCOVER	[Cash Earnings / Current Dividend]
CASHINTCOV	[Cash Earnings / Interest Expense]
CASHNAV	[Cash Earnings / Net Asset Value]
CASHNTAV	[Cash Earnings / Net Tangible Assets]
CASHPS	[Bank Cash / Number of Shares]
CASHTBORREP	[Bank Cash / Borrowings Repayable]
CASHTCA	[Bank Cash / Current Assets]
CASHTCL	[Bank Cash / Current Assets]
CASHTCRED	[Bank cash / creditors]
CASHTLOANCAP	[Bank cash / loan capital repayable]
CASHTNCA	[Bank cash / non current assets]
CASHTTD	[Bank cash / total debt]
CCC	[Debtors days + Inventory days - creditors days]
CF_MARG	[Cash flow margin]
CFMTP	[Cash flow margin / price]
CFOBORREP	[Cash flow from operations / borrowings repayable]
CFOCASHPS	[Cash flow from operations / cash per share]
CFODIVCOVER	[Cash flow from operations / Dividend cover]
CFOLOAN_CAP	[Cash flow from operations / loan capital]
CFONAV	[Cash flow from operations / Net asset value]
CFONTAV	[Cash flow from operations / Net tangible asset value]
CFOPS	[Cash flow from operations / number of shares]
CFOTCL	[Cash flow from operations / current liabilities]
CFOTTD	[Cash flow from operations / total debt]
CFT	[Cash flow / loan capital]
CFTBOR_REPAY	[cash flow / borrowings repayable]
CFTP	[Cash flow / price]
CFTTOT_DEBT	[Cash flow / debt]
CH_CASH	[Change in Cash]
CLPS	[Current liabilities / number of shares]
CREDDAYS	[365 / Creditors turnover
CREDTURN	[Cost of sales / Inventory

A.2. Construction of Firm-specific Attributes from DataStream International Data cont..

The table shows the construction of the firm-specific attributes using data from DataStream International, available at the University of Cape Town. Some attributes are taken directly from DataStream International. Characteristics while other are constructed. The definitions of the attributes' components are included in Appendix A.1.

CREDDAYS	[365 / Creditors turnover
CREDTURN	[Cost of sales / Inventory
CUR_RATIO	[Current ratio]
DEBT_DAYS	[Debtors days]
DEBTCASHPS	[debt to cash / number of shares]
DEBTNAV	[Debt / net asset value]
DEBTNTAV	[Debt / net tangible asset value]
DEPCNPS	[Depreciation / number of shares]
DEPCNTNCA	[Depreciation / non current assets]
DEPCNTTA	[Depreciation / total assets]
DFL	[%change in EPS / % change in EBIT]
DIV_PAID	[Dividend paid]
DIVCOVER	[Dividend cover]
DOL	[%change in EBIT / % change in Sales]
DPS	[Dividend / number of shares]
DTL	[%change in EPS / % change in Sales]
DY	[Dividend Yield]
EBITDAINTCOV	EBITDA / interest expense]
EBITLOAN_CAP	[EBIT / loan capital]
EBITPS	[EBIT / number of shares]
EBITTCA	EBIT / Current liabilities
EBITTCL	[EBIT / current liabilities]
EBITTNAV	[EBIT / Net asset value]
EBITTNTAV	[EBIT / Net tangible asset value]
EBITTTD	[EBIT / total debt]
EPS	[Earnings per share]
EQUTTD	[Equity and Reserves / total debt]
EY	[Earnings Yield]
GROW1	[(1-POUT) * ROE]
GROW2	[Retention rate * ROE]
LCPS	[Loan capital/ number of shares]
MA_12	$([Price]_t + \ldots [Price]_{t-12}) / 12]$
MA_2	$([Price]_t + [Price]_{t-1}) / 2]$
MA_3	$([Price]_t + \ldots [Price]_{t-2}) / 3]$
MA_6	$([Price]_t + \ldots [Price]_{t-5}) / 6]$
MA_8	$([Price]_t + \ldots [Price]_{t-7}) / 8]$
MTBV	[Market / book value]
MVTRADE	[Turnover by Volume] * [Price]
MVTRADEMV	([Turnover by Volume] * [Price]) / [Market Value]
NCAPS	[Non Current assets / number of shares]
NCATEQU	[Non Current assets / equity and reserves]

A.2. Construction of Firm-specific Attributes from DataStream International Data cont..

The table shows the construction of the firm-specific attributes using data from DataStream International, available at the University of Cape Town. Some attributes are taken directly from DataStream International. Characteristics while other are constructed. The definitions of the attributes' components are included in Appendix A.1.

PSALES	[price / sales]
PTCA	[price / current assets]
PTNCA	[price / non current assets]
QUICK	[Quick ratio]
RECDAYS	[365 / Receivables turnover
RECTURN	[Sales / Receivables]
RETEN	[retention ratio]
RI	[total return]
RNDTSALES	[RND / total sales]
RNDTTA	[RND / total assets]
ROCE	[(Net Income / Sales) * (Sales / Total Assets) * (Total Assets / Equity and Reserves)]
ROCOMEQU1	[(Net Income - Preference Dividend) / shareholders equity]
ROCOMEQU2	[(Net Income) / shareholders equity]
ROE	[Return on equity]
ROTC1	[(Net Income + Interest Expense) / total equity]
ROTC2	[Net Income / total equity]
SALESPS	[sales / share]
SALESTP	[sales / price]
SCASHPS	[cash sales / number of shares]
SNAV	[sales / net asset value]
SNTAV	[sales / Net tangible asset value]
STCA	[sales / current assets]
STCL	[sales / current liabilities]
STEQUITY	[sales / equity]
STNCA	[sales / non current assets]
STNO_EE	[sales / number of employees]
STOCK_RATIO	[Stock ratio]
STTD	[sales / total debt]
TAPS	[Total assets employed / number of shares]
TATTA	[Tangible assets / Total assets]
TDPS	[total debt / number of shares]
TDTNAV	[total debt / net asset value]
TDTNTAV	[total debt / Net tangible asset value]
TDTTA	[total debt / total assets]
TLCTA	[Loan capital / assets]
TV	([Turnover by Volume]$_t$ / [Trading Days]$_t$) / [Number of Shares]$_{t-1}$
VO	[Turnover by Volume]
VOLTTRADDAYS	[Volume trading days]
Change in attribute calculation	
(e.g. DY_12M)	([DY]$_t$ - [DY]$_{t-12}$) / [DY]$_{t-12}$]
(e.g. DY_1M)	([DY]$_t$ - [DY]$_{t-1}$) / [DY]$_{t-1}$]

A.3. Firm-specific Attributes monthly changes

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

A_TURN_12M	Asset Turnover change 12M
A_TURN_18M	Asset Turnover change 18M
A_TURN_24M	Asset Turnover change 24M
A_TURN_30M	Asset Turnover change 30M
A_TURN_36M	Asset Turnover change 36M
AMORT_INT_12M	Amortised intangibles change 12M
AMORT_INT_18M	Amortised intangibles change 18M
AMORT_INT_24M	Amortised intangibles change 24M
AMORT_INT_30M	Amortised intangibles change 30M
AMORT_INT_36M	Amortised intangibles change 36M
BOR_REPAY_12M	Borrowings repayable change 12M
BOR_REPAY_18M	Borrowings repayable change 18M
BOR_REPAY_24M	Borrowings repayable change 24M
BOR_REPAY_30M	Borrowings repayable change 30M
BOR_REPAY_36M	Borrowings repayable change 36M
BORROW_RATIO_12M	Borrowing ratio change 12M
BORROW_RATIO_18M	Borrowing ratio change 18M
BORROW_RATIO_24M	Borrowing ratio change 24M
BORROW_RATIO_30M	Borrowing ratio change 30M
BORROW_RATIO_36M	Borrowing ratio change 36M
BTMV_12M	Book to market value change 12M
BTMV_18M	Book to market value change 18M
BTMV_1M	Book to market value change 24M
BTMV_24M	Book to market value change 30M
BTMV_30M	Book to market value change 36M
BTMV_36M	Book to market value change 36M
BTMV_3M	Book to market value change 3M
BTMV_6M	Book to market value change 6M
CA_12M	Current Assets change 12M
CA_18M	Current Assets change 18M
CA_24M	Current Assets change 24M
CA_30M	Current Assets change 30M
CA_36M	Current Assets change 36M
CASH_EPS_12M	Cash Earnings per share change 12M
CASH_EPS_18M	Cash Earnings per share change 18M
CASH_EPS_24M	Cash Earnings per share change 24M
CASH_EPS_30M	Cash Earnings per share change 30M
CASH_EPS_36M	Cash Earnings per share change 36M
CASH_EQUIV_12M	Cash and Cash Equivalents change 12M
CASH_EQUIV_18M	Cash and Cash Equivalents change 18M
CASH_EQUIV_24M	Cash and Cash Equivalents change 24M
CASH_EQUIV_30M	Cash and Cash Equivalents change 30M
CASH_EQUIV_36M	Cash and Cash Equivalents change 36M
CCC_12M	Cash conversion Cycle change 12m
CCC_18M	Cash conversion Cycle change 18m

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

CCC_24M	Cash conversion Cycle change 24m
CCC_30M	Cash conversion Cycle change 30m
CCC_36M	Cash conversion Cycle change 36m
CF_12M	Cash flow change 12M
CF_18M	Cash flow change 18M
CF_24M	Cash flow change 24M
CF_30M	Cash flow change 30M
CF_36M	Cash flow change 36M
CF_MARG_12M	Cash flow margin change 12M
CF_MARG_18M	Cash flow margin change 18M
CF_MARG_24M	Cash flow margin change 24M
CF_MARG_30M	Cash flow margin change 30M
CF_MARG_36M	Cash flow margin change 36M
CFO_12M	Cash flow from operations change 12M
CFO_18M	Cash flow from operations change 18M
CFO_24M	Cash flow from operations change 24M
CFO_30M	Cash flow from operations change 30M
CFO_36M	Cash flow from operations change 36M
CH_CASH_12M	Changes in cash change 12M
CH_CASH_18M	Changes in cash change 18M
CH_CASH_24M	Changes in cash change 24M
CH_CASH_30M	Changes in cash change 30M
CH_CASH_36M	Changes in cash change 36M
CL_12M	Current liabilities change 12M
CL_18M	Current liabilities change 18M
CL_24M	Current liabilities change 24M
CL_30M	Current liabilities change 30M
CL_36M	Current liabilities change 36M
CLPS_12M	Current liabilities per share change 12M
CLPS_18M	Current liabilities per share change 18M
CLPS_24M	Current liabilities per share change 24M
CLPS_30M	Current liabilities per share change 30M
CLPS_36M	Current liabilities per share change 36M
COGS_12M	Cost of Sales change 12M
COGS_18M	Cost of Sales change 18M
COGS_24M	Cost of Sales change 24M
COGS_30M	Cost of Sales change 30M
COGS_36M	Cost of Sales change 36M
CREDDAYS_12M	Creditors days change 12M
CREDDAYS_18M	Creditors days change 18M
CREDDAYS_24M	Creditors days change 24M
CREDDAYS_30M	Creditors days change 30M
CREDDAYS_36M	Creditors days change 36M
CREDTURN_12M	Creditors turnover change 12M
CREDTURN_18M	Creditors turnover change 18M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

CREDTURN_24M	Creditors turnover change 24M
CREDTURN_30M	Creditors turnover change 30M
CREDTURN_36M	Creditors turnover change 36M
CUR_RATIO_12M	Current ratio change 12M
CUR_RATIO_18M	Current ratio change 18M
CUR_RATIO_24M	Current ratio change 24M
CUR_RATIO_30M	Current ratio change 30M
CUR_RATIO_36M	Current ratio change 36M
DEBT_DAYS_12M	Debtors days change 12M
DEBT_DAYS_18M	Debtors days change 18M
DEBT_DAYS_24M	Debtors days change 24M
DEBT_DAYS_30M	Debtors days change 30M
DEBT_DAYS_36M	Debtors days change 36M
DEPCN_12M	Depreciation change 12M
DEPCN_18M	Depreciation change 18M
DEPCN_24M	Depreciation change 24M
DEPCN_30M	Depreciation change 30M
DEPCN_36M	Depreciation change 36M
DIV_PAID_12M	Dividend paid change 12M
DIV_PAID_18M	Dividend paid change 18M
DIV_PAID_24M	Dividend paid change 24M
DIV_PAID_30M	Dividend paid change 30M
DIV_PAID_36M	Dividend paid change 36M
DIVCOVER_12M	Dividend cover change 12M
DIVCOVER_18M	Dividend cover change 18M
DIVCOVER_24M	Dividend cover change 24M
DIVCOVER_30M	Dividend cover change 30M
DIVCOVER_36M	Dividend cover change 36M
DPS_12M	Dividend per share change 12M
DPS_18M	Dividend per share change 18M
DPS_24M	Dividend per share change 24M
DPS_30M	Dividend per share change 30M
DPS_36M	Dividend per share change 36M
DY_12M	Dividend Yield change 12M
DY_18M	Dividend Yield change 18M
DY_1M	Dividend Yield change 1M
DY_24M	Dividend Yield change 24M
DY_30M	Dividend Yield change 30M
DY_36M	Dividend Yield change 36M
DY_3M	Dividend Yield change 3M
DY_6M	Dividend Yield change 6M
EBIT_12M	EBIT change 12M
EBIT_18M	EBIT change 18M
EBIT_24M	EBIT change 24M
EBIT_30M	EBIT change 30M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

EBIT_36M	EBIT change 36M
EBITDA_12M	EBITDA change 12M
EBITDA_18M	EBITDA change 18M
EBITDA_24M	EBITDA change 24M
EBITDA_30M	EBITDA change 30M
EBITDA_36M	EBITDA change 36M
EPS_12M	Earnings per share change 12M
EPS_18M	Earnings per share change 18M
EPS_1M	Earnings per share change 1M
EPS_24M	Earnings per share change 24M
EPS_30M	Earnings per share change 30M
EPS_36M	Earnings per share change 36M
EPS_3M	Earnings per share change 3M
EPS_6M	Earnings per share change 6M
EQU_RES_12M	Equity and Reserves change 12M
EQU_RES_18M	Equity and Reserves change 18M
EQU_RES_24M	Equity and Reserves change 24M
EQU_RES_30M	Equity and Reserves change 30M
EQU_RES_36M	Equity and Reserves change 36M
EY_12M	Earnings Yield change 12M
EY_18M	Earnings Yield change 18M
EY_1M	Earnings Yield change 1M
EY_24M	Earnings Yield change 24M
EY_30M	Earnings Yield change 30M
EY_36M	Earnings Yield change 36M
EY_3M	Earnings Yield change 3M
EY_6M	Earnings Yield change 6M
GROW1_12M	Growth1 change 12M
GROW1_18M	Growth1 change 18M
GROW1_24M	Growth1 change 24M
GROW1_30M	Growth1 change 30M
GROW1_36M	Growth1 change 36M
GROW2_12M	Growth2 change 12M
GROW2_18M	Growth2 change 18M
GROW2_24M	Growth2 change 24M
GROW2_30M	Growth2 change 30M
GROW2_36M	Growth2 change 36M
INT_EXP_12M	Interest expense change 12M
INT_EXP_18M	Interest expense change 18M
INT_EXP_24M	Interest expense change 24M
INT_EXP_30M	Interest expense change 30M
INT_EXP_36M	Interest expense change 36M
INTANG_BS_12M	Intangibles on Balance Sheet change 12M
INTANG_BS_18M	Intangibles on Balance Sheet change 18M
INTANG_BS_24M	Intangibles on Balance Sheet change 24M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

INTANG_BS_30M	Intangibles on Balance Sheet change 30M
INTANG_BS_36M	Intangibles on Balance Sheet change 36M
INV_WIP_12M	Inventory change 12M
INV_WIP_18M	Inventory change 18M
INV_WIP_24M	Inventory change 24M
INV_WIP_30M	Inventory change 30M
INV_WIP_36M	Inventory change 36M
INVDAYS_12M	Inventory days change 12M
INVDAYS_18M	Inventory days change 18M
INVDAYS_24M	Inventory days change 24M
INVDAYS_30M	Inventory days change 30M
INVDAYS_36M	Inventory days change 36M
INVTURN_12M	Inventory turnover change 12M
INVTURN_18M	Inventory turnover change 18M
INVTURN_24M	Inventory turnover change 24M
INVTURN_30M	Inventory turnover change 30M
INVTURN_36M	Inventory turnover change 36M
LNDY_12M	Natural log dividend yield change 12M
LNDY_18M	Natural log dividend yield change 18M
LNDY_1M	Natural log dividend yield change 1M
LNDY_24M	Natural log dividend yield change 24M
LNDY_3M	Natural log dividend yield change 3M
LNDY_6M	Natural log dividend yield change 6M
LNEY_12M	Natural log earnings yield change 12M
LNEY_18M	Natural log earnings yield change 18M
LNEY_1M	Natural log earnings yield change 1M
LNEY_24M	Natural log earnings yield change 24M
LNEY_3M	Natural log earnings yield change 3M
LNEY_6M	Natural log earnings yield change 6M
LNMTBV_12M	Natural log market to book value change 12M
LNMTBV_18M	Natural log market to book value change 18M
LNMTBV_1M	Natural log market to book value change 1M
LNMTBV_24M	Natural log market to book value change 24M
LNMTBV_3M	Natural log market to book value change 3M
LNMTBV_6M	Natural log market to book value change 6M
LNMV_12M	Natural log market value change 12M
LNMV_18M	Natural log market value change 18M
LNMV_1M	Natural log market value change 1M
LNMV_24M	Natural log market value change 24M
LNMV_30M	Natural log market value change 30M
LNMV_36M	Natural log market value change 36M
LNMV_3M	Natural log market value change 3M
LNMV_6M	Natural log market value change 6M
LNNET_ASSETS_12M	Natural log net assets change 12M
LNNET_ASSETS_18M	Natural log net assets change 18M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

LNNET_ASSETS_24M	Natural log net assets change 24M
LNNET_ASSETS_30M	Natural log net assets change 30M
LNNET_ASSETS_36M	Natural log net assets change 36M
LNNI_ORDSH_12M	Natural log net income to ordinary shareholder change 12M
LNNI_ORDSH_18M	Natural log net income to ordinary shareholder change 18M
LNNI_ORDSH_24M	Natural log net income to ordinary shareholder change 24M
LNNI_ORDSH_30M	Natural log net income to ordinary shareholder change 30M
LNNI_ORDSH_36M	Natural log net income to ordinary shareholder change 36M
LNNIAT1_12M	Natural log net income after tax change 12M
LNNIAT1_18M	Natural log net income after tax change 18M
LNNIAT1_24M	Natural log net income after tax change 24M
LNNIAT1_30M	Natural log net income after tax change 30M
LNNIAT1_36M	Natural log net income after tax change 36M
LNP_12M	Natural log price change 12M
LNP_18M	Natural log price change 18M
LNP_1M	Natural log price change 1M
LNP_24M	Natural log price change 24M
LNP_30M	Natural log price change 30M
LNP_36M	Natural log price change 36M
LNP_3M	Natural log price change 3M
LNP_6M	Natural log price change 6M
LNPE_12M	Natural log PE ratio change 12M
LNPE_18M	Natural log PE ratio change 18M
LNPE_1M	Natural log PE ratio change 1M
LNPE_24M	Natural log PE ratio change 24M
LNPE_30M	Natural log PE ratio change 30M
LNPE_36M	Natural log PE ratio change 36M
LNPE_3M	Natural log PE ratio change 3M
LNPE_6M	Natural log PE ratio change 6M
LNPEG1_12M	Natural log peg ratio change 12M
LNPEG1_18M	Natural log peg ratio change 18M
LNPEG1_1M	Natural log peg ratio change 1M
LNPEG1_24M	Natural log peg ratio change 24M
LNPEG1_3M	Natural log peg ratio change 3M
LNPEG1_6M	Natural log peg ratio change 6M
LNPEG2_12M	Natural log peg ratio change 12M
LNPEG2_18M	Natural log peg ratio change 18M
LNPEG2_1M	Natural log peg ratio change 1M
LNPEG2_24M	Natural log peg ratio change 24M
LNPEG2_3M	Natural log peg ratio change 3M
LNPEG2_6M	Natural log peg ratio change 6M
LNPNAV_12M	Natural log price to net asset value change 12M
LNPNAV_18M	Natural log price to net asset value change 18M
LNPNAV_1M	Natural log price to net asset value change 1M
LNPNAV_24M	Natural log price to net asset value change 24M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

LNPNAV_3M	Natural log price to net asset value change 3M
LNPNAV_6M	Natural log price to net asset value change 6M
LNPNTAV_12M	Natural log price to net tangible asset value change 12M
LNPNTAV_18M	Natural log price to net tangible asset value change 18M
LNPNTAV_24M	Natural log price to net tangible asset value change 24M
LNPNTAV_3M	Natural log price to net tangible asset value change 3M
LNPNTAV_6M	Natural log price to net tangible asset value change 6M
LNPNTAVROE_12M	Natural log price to NTAV * ROE change 12M
LNPNTAVROE_18M	Natural log price to NTAV * ROE change 18M
LNPNTAVROE_24M	Natural log price to NTAV * ROE change 24M
LNPNTAVROE_3M	Natural log price to NTAV * ROE change 3M
LNPNTAVROE_6M	Natural log price to NTAV * ROE change 6M
LNPSALES_12M	Natural log price to sales change 12M
LNPSALES_18M	Natural log price to sales change 18M
LNPSALES_1M	Natural log price to sales change 1M
LNPSALES_24M	Natural log price to sales change 24M
LNPSALES_3M	Natural log price to sales change 3M
LNPSALES_6M	Natural log price to sales change 6M
LNPTCA_12M	Natural log price to current assets 12M
LNPTCA_18M	Natural log price to current assets 18M
LNPTCA_24M	Natural log price to current assets 24M
LNPTCA_3M	Natural log price to current assets 3M
LNPTCA_6M	Natural log price to current assets 6M
LNRI_12M	Natural log total return change 12M
LNRI_18M	Natural log total return change 18M
LNRI_1M	Natural log total return change 1M
LNRI_24M	Natural log total return change 24M
LNRI_30M	Natural log total return change 30M
LNRI_36M	Natural log total return change 36M
LNRI_3M	Natural log total return change 3M
LNRI_6M	Natural log total return change 6M
MV_12M	Market Value change 12M
MV_18M	Market Value change 18M
MV_1M	Market Value change 1M
MV_24M	Market Value change 24M
MV_30M	Market Value change 30M
MV_36M	Market Value change 36M
MV_3M	Market Value change 3M
MV_6M	Market Value change 6M
MVTRADE_12M	Market Value traded change 12M
MVTRADE_18M	Market Value traded change 18M
MVTRADE_1M	Market Value traded change 1M
MVTRADE_24M	Market Value traded change 24M
MVTRADE_30M	Market Value traded change 30M
MVTRADE_36M	Market Value traded change 36M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

MVTRADE_3M	Market Value traded change 3M
MVTRADE_6M	Market Value traded change 6M
MVTRADEMV_12M	Market Value traded to market value change 12M
MVTRADEMV_18M	Market Value traded to market value change 18M
MVTRADEMV_1M	Market Value traded to market value change 1M
MVTRADEMV_24M	Market Value traded to market value change 24M
MVTRADEMV_30M	Market Value traded to market value change 30M
MVTRADEMV_36M	Market Value traded to market value change 36M
MVTRADEMV_3M	Market Value traded to market value change 3M
MVTRADEMV_6M	Market Value traded to market value change 6M
NAV_12M	Net Asset value change 12M
NAV_18M	Net Asset value change 18M
NAV_24M	Net Asset value change 24M
NAV_30M	Net Asset value change 30M
NAV_36M	Net Asset value change 36M
NAV_3M	Net Asset value change 3M
NAV_6M	Net Asset value change 6M
NET_ASSETS_12M	Net Asset value on Balance Sheet change 12M
NET_ASSETS_18M	Net Asset value on Balance Sheet change 18M
NET_ASSETS_24M	Net Asset value on Balance Sheet change 24M
NET_ASSETS_30M	Net Asset value on Balance Sheet change 30M
NET_ASSETS_36M	Net Asset value on Balance Sheet change 36M
NET_DEBT_12M	Net Debt change 12M
NET_DEBT_18M	Net Debt change 18M
NET_DEBT_24M	Net Debt change 24M
NET_DEBT_30M	Net Debt change 30M
NET_DEBT_36M	Net Debt change 36M
NETCASHFLOW_12M	Net Cash flow change 12M
NETCASHFLOW_18M	Net Cash flow change 18M
NETCASHFLOW_24M	Net Cash flow change 24M
NETCASHFLOW_30M	Net Cash flow change 30M
NETCASHFLOW_36M	Net Cash flow change 36M
NI_ORDSH_12M	Net income to ordinary share holders change 12M
NI_ORDSH_18M	Net income to ordinary share holders change 18M
NI_ORDSH_24M	Net income to ordinary share holders change 24M
NI_ORDSH_30M	Net income to ordinary share holders change 30M
NI_ORDSH_36M	Net income to ordinary share holders change 36M
NIAT1_12M	Net Income change 12M
NIAT1_18M	Net Income change 18M
NIAT1_24M	Net Income change 24M
NIAT1_30M	Net Income change 30M
NIAT1_36M	Net Income change 36M
NIPS_12M	Net Income per share change 12M
NIPS_18M	Net Income per share change 18M
NIPS_24M	Net Income per share change 24M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

NIPS_30M	Net Income per share change 30M
NIPS_36M	Net Income per share change 36M
NP_MARG_12M	Net profit margin change 12M
NP_MARG_18M	Net profit margin change 18M
NP_MARG_24M	Net profit margin change 24M
NP_MARG_30M	Net profit margin change 30M
NP_MARG_36M	Net profit margin change 36M
NPBT_12M	Net profit before tax change 12M
NPBT_18M	Net profit before tax change 18M
NPBT_24M	Net profit before tax change 24M
NPBT_30M	Net profit before tax change 30M
NPBT_36M	Net profit before tax change 36M
NPBTPOFMARG_12M	Net Profit before tax margin change 12M
NPBTPOFMARG_18M	Net Profit before tax margin change 18M
NPBTPOFMARG_24M	Net Profit before tax margin change 24M
NPBTPOFMARG_30M	Net Profit before tax margin change 30M
NPBTPOFMARG_36M	Net Profit before tax margin change 36M
NS_12M	Number of shares in issue change 12M
NS_18M	Number of shares in issue change 18M
NS_1M	Number of shares in issue change 1M
NS_24M	Number of shares in issue change 24M
NS_30M	Number of shares in issue change 30M
NS_36M	Number of shares in issue change 36M
NS_3M	Number of shares in issue change 3M
NS_6M	Number of shares in issue change 6M
NTA_12M	Net Tangible Assets change 12M
NTA_18M	Net Tangible Assets change 18M
NTA_24M	Net Tangible Assets change 24M
NTA_30M	Net Tangible Assets change 30M
NTA_36M	Net Tangible Assets change 36M
OP_PROFIT_ADJ_12M	Operating profit change 12M
OP_PROFIT_ADJ_18M	Operating profit change 18M
OP_PROFIT_ADJ_24M	Operating profit change 24M
OP_PROFIT_ADJ_30M	Operating profit change 30M
OP_PROFIT_ADJ_36M	Operating profit change 36M
OP_PROFMARG_12M	Operating profit margin change 12M
OP_PROFMARG_18M	Operating profit margin change 18M
OP_PROFMARG_24M	Operating profit margin change 24M
OP_PROFMARG_30M	Operating profit margin change 30M
OP_PROFMARG_36M	Operating profit margin change 36M
OP_PROFMARGIN2_12M	Operating profit margin change 12M
OP_PROFMARGIN2_18M	Operating profit margin change 18M
OP_PROFMARGIN2_24M	Operating profit margin change 24M
OP_PROFMARGIN2_30M	Operating profit margin change 30M
OP_PROFMARGIN2_36M	Operating profit margin change 36M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

OPMTP_12M	Operating profit margin change 12M
OPMTP_18M	Operating profit margin change 18M
OPMTP_24M	Operating profit margin change 24M
OPMTP_30M	Operating profit margin change 30M
OPMTP_36M	Operating profit margin change 36M
P_12M	Price change 12M
P_18M	Price change 18M
P_1M	Price change 1M
P_24M	Price change 24M
P_30M	Price change 30M
P_36M	Price change 36M
P_3M	Price change 3M
P_6M	Price change 6M
PE_12M	Price Earnings ratio change 12M
PE_18M	Price Earnings ratio change 18M
PE_1M	Price Earnings ratio change 1M
PE_24M	Price Earnings ratio change 24M
PE_30M	Price Earnings ratio change 30M
PE_36M	Price Earnings ratio change 36M
PE_3M	Price Earnings ratio change 3M
PE_6M	Price Earnings ratio change 6M
PEG1_12M	Peg ratio change 12M
PEG1_18M	Peg ratio change 18M
PEG1_1M	Peg ratio change 1M
PEG1_24M	Peg ratio change 24M
PEG1_30M	Peg ratio change 30M
PEG1_36M	Peg ratio change 36M
PEG1_3M	Peg ratio change 3M
PEG1_6M	Peg ratio change 6M
PEG2_12M	Peg ratio change 12M
PEG2_18M	Peg ratio change 18M
PEG2_1M	Peg ratio change 1M
PEG2_24M	Peg ratio change 24M
PEG2_30M	Peg ratio change 30M
PEG2_36M	Peg ratio change 36M
PEG2_3M	Peg ratio change 3M
PEG2_6M	Peg ratio change 6M
PNAV_12M	Price to Net asset value change 12M
PNAV_18M	Price to Net asset value change 18M
PNAV_1M	Price to Net asset value change 1M
PNAV_24M	Price to Net asset value change 24M
PNAV_30M	Price to Net asset value change 30M
PNAV_36M	Price to Net asset value change 36M
PNAV_3M	Price to Net asset value change 3M
PNAV_6M	Price to Net asset value change 6M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

PNAVROE_12M	Price to net asset value * ROE change 12M
PNAVROE_18M	Price to net asset value * ROE change 18M
PNAVROE_24M	Price to net asset value * ROE change 24M
PNAVROE_30M	Price to net asset value * ROE change 30M
PNAVROE_36M	Price to net asset value * ROE change 36M
PNAVROE_3M	Price to net asset value * ROE change 3M
PNAVROE_6M	Price to net asset value * ROE change 6M
PNTAV_12M	Price to Net tangible asset value change 12M
PNTAV_18M	Price to Net tangible asset value change 18M
PNTAV_24M	Price to Net tangible asset value change 24M
PNTAV_30M	Price to Net tangible asset value change 30M
PNTAV_36M	Price to Net tangible asset value change 36M
PNTAVROE_12M	Price to Net tangible asset value *ROE change 12M
PNTAVROE_18M	Price to Net tangible asset value *ROE change 18M
PNTAVROE_24M	Price to Net tangible asset value *ROE change 24M
PNTAVROE_30M	Price to Net tangible asset value *ROE change 30M
PNTAVROE_36M	price to Net tangible asset value *ROE change 36M
PSALES_12M	Price change 12M
PSALES_18M	Price change 18M
PSALES_24M	Price change 24M
PSALES_30M	Price change 30M
PSALES_36M	Price change 36M
PSALES_3M	Price change 3M
PSALES_6M	Price change 6M
QUICK_12M	Quick ratio change 12M
QUICK_18M	Quick ratio change 18M
QUICK_24M	Quick ratio change 24M
QUICK_30M	Quick ratio change 30M
QUICK_36M	Quick ratio change 36M
RECDAYS_12M	Receivables days 12M
RECDAYS_18M	Receivables days 18M
RECDAYS_24M	Receivables days 24M
RECDAYS_30M	Receivables days 30M
RECDAYS_36M	Receivables days 36M
RECTURN_12M	Receivables turnover 12M
RECTURN_18M	Receivables turnover 18M
RECTURN_24M	Receivables turnover 24M
RECTURN_30M	Receivables turnover 30M
RECTURN_36M	Receivables turnover 36M
RETEN_12M	Retention ratio 12M
RETEN_18M	Retention ratio 18M
RETEN_24M	Retention ratio 24M
RETEN_30M	Retention ratio 30M
RETEN_36M	Retention ratio 36M
RETEN_6M	Retention ratio 6M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

RI_12M	Momentum 12M
RI_18M	Momentum 18M
RI_1M	Momentum 1M
RI_24M	Momentum 24M
RI_30M	Momentum 30M
RI_36M	Momentum 36M
RI_3M	Momentum 3M
RI_6M	Momentum 6M
RND_IS_12M	Research and development on Income Statement 12M
RND_IS_18M	Research and development on Income Statement 18M
RND_IS_24M	Research and development on Income Statement 24M
RND_IS_30M	Research and development on Income Statement 30M
RND_IS_36M	Research and development on Income Statement 36M
ROCE_12M	Return on Capital Employed 12M
ROCE_18M	Return on Capital Employed 18M
ROCE_24M	Return on Capital Employed 24M
ROCE_30M	Return on Capital Employed 30M
ROCE_36M	Return on Capital Employed 36M
ROCOMEQU1_12M	Return on common equity 2 12M
ROCOMEQU1_18M	Return on common equity 3 18M
ROCOMEQU1_24M	Return on common equity 4 24M
ROCOMEQU1_30M	Return on common equity 5 30M
ROCOMEQU1_36M	Return on common equity 6 36M
ROCOMEQU2_12M	Return on common equity 3 12M
ROCOMEQU2_18M	Return on common equity 4 18M
ROCOMEQU2_24M	Return on common equity 5 24M
ROCOMEQU2_30M	Return on common equity 6 30M
ROCOMEQU2_36M	Return on common equity 7 36M
ROE_12M	Return on equity 12M
ROE_18M	Return on equity 18M
ROE_24M	Return on equity 24M
ROE_30M	Return on equity 30M
ROE_36M	Return on equity 36M
ROTC1_12M	Return on total capital2 12M
ROTC1_18M	Return on total capital3 18M
ROTC1_24M	Return on total capital4 24M
ROTC1_30M	Return on total capital5 30M
ROTC1_36M	Return on total capital6 36M
ROTC2_12M	Return on total capital3 12M
ROTC2_18M	Return on total capital4 18M
ROTC2_24M	Return on total capital5 24M
ROTC2_30M	Return on total capital6 30M
ROTC2_36M	Return on total capital7 36M
SALESPS_12M	Sales per share change 12M
SALESPS_18M	Sales per share change 18M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

SALESPS_24M	Sales per share change 24M
SALESPS_30M	Sales per share change 30M
SALESPS_36M	Sales per share change 36M
SALESTP_12M	Sales to price change 12M
SALESTP_18M	Sales to price change 18M
SALESTP_24M	Sales to price change 24M
SALESTP_30M	Sales to price change 30M
SALESTP_36M	Sales to price change 36M
SHARECAP_RES_12M	Share capital and reserves change 12M
SHARECAP_RES_18M	Share capital and reserves change 18M
SHARECAP_RES_24M	Share capital and reserves change 24M
SHARECAP_RES_30M	Share capital and reserves change 30M
SHARECAP_RES_36M	Share capital and reserves change 36M
SNAV_12M	Sales to net asset value change 12M
SNAV_18M	Sales to net asset value change 18M
SNAV_24M	Sales to net asset value change 24M
SNAV_30M	Sales to net asset value change 30M
SNAV_36M	Sales to net asset value change 36M
TA_EMPLOY_12M	Total assets employed change 12M
TA_EMPLOY_18M	Total assets employed change 18M
TA_EMPLOY_24M	Total assets employed change 24M
TA_EMPLOY_30M	Total assets employed change 30M
TA_EMPLOY_36M	Total assets employed change 36M
TATTA_12M	Tangible assets to Total assets change 12M
TATTA_18M	Tangible assets to Total assets change 18M
TATTA_24M	Tangible assets to Total assets change 24M
TATTA_30M	Tangible assets to Total assets change 30M
TATTA_36M	Tangible assets to Total assets change 36M
TDPS_12M	Total debt per share change 12M
TDPS_18M	Total debt per share change 18M
TDPS_24M	Total debt per share change 24M
TDPS_30M	Total debt per share change 30M
TDPS_36M	Total debt per share change 36M
TOT_ASSETS_12M	Total assets change 12M
TOT_ASSETS_18M	Total assets change 18M
TOT_ASSETS_24M	Total assets change 24M
TOT_ASSETS_30M	Total assets change 30M
TOT_ASSETS_36M	Total assets change 36M
TOT_CE_12M	Total Common Equity change 12M
TOT_CE_18M	Total Common Equity change 18M
TOT_CE_24M	Total Common Equity change 24M
TOT_CE_30M	Total Common Equity change 30M
TOT_CE_36M	Total Common Equity change 36M
TOT_CRED_12M	Creditors change 12M
TOT_CRED_18M	Creditors change 18M

A.3. Firm-specific Attributes monthly changes continued..

The table shows the list of firm-specific attributes that are monthly changes of some if the attributes listed table 4.1 and their codenames used in this thesis. The data were extracted from DataStream International, available at the University of Cape Town. The suffix of the attribute in the left column refers to the number of months percentage change. "_12M" for example depicts to a 12 month change of the original attribute. The attributes are either downloaded from DataStream international or constructed using the values of the downloaded data.. Refer to Table 4.1, Appendix A.1 and A.2 for the definitions of the firm-specific attributes.

TOT_CRED_24M	Creditors change 24M
TOT_CRED_30M	Creditors change 30M
TOT_CRED_36M	Creditors change 36M
TOT_DEBTORS_12M	Total debtors change 12M
TOT_DEBTORS_18M	Total debtors change 18M
TOT_DEBTORS_24M	Total debtors change 24M
TOT_DEBTORS_30M	Total debtors change 30M
TOT_DEBTORS_36M	Total debtors change 36M
TOT_SALES_12M	Total sales change 12M
TOT_SALES_18M	Total sales change 18M
TOT_SALES_24M	Total sales change 24M
TOT_SALES_30M	Total sales change 30M
TOT_SALES_36M	Total sales change 36M
TOTAL_DEBT_12M	Total debt change 12M
TOTAL_DEBT_18M	Total debt change 18M
TOTAL_DEBT_24M	Total debt change 24M
TOTAL_DEBT_30M	Total debt change 30M
TOTAL_DEBT_36M	Total debt change 36M
TV_12M	Trading volume ratio change 12M
TV_18M	Trading volume ratio change 18M
TV_1M	Trading volume ratio change 1M
TV_24M	Trading volume ratio change 24M
TV_30M	Trading volume ratio change 30M
TV_36M	Trading volume ratio change 36M
TV_3M	Trading volume ratio change 3M
TV_6M	Trading volume ratio change 6M
VO_12M	Absolute trading volume change 12M
VO_18M	Absolute trading volume change 18M
VO_1M	Absolute trading volume change 1M
VO_24M	Absolute trading volume change 24M
VO_30M	Absolute trading volume change 30M
VO_36M	Absolute trading volume change 36M
VO_3M	Absolute trading volume change 3M
VO_6M	Absolute trading volume change 6M
VOLTTRADDAYS_12M	Volume trading days change 12M
VOLTTRADDAYS_18M	Volume trading days change 18M
VOLTTRADDAYS_1M	Volume trading days change 1M
VOLTTRADDAYS_24M	Volume trading days change 24M
VOLTTRADDAYS_30M	Volume trading days change 30M
VOLTTRADDAYS_36M	Volume trading days change 36M
VOLTTRADDAYS_3M	Volume trading days change 3M
VOLTTRADDAYS_6M	Volume trading days change 6M

A.4. Descriptive Statistics of the Firm-specific Attributes

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
A_TURN	5.70	1.63	86.38	30507
AMORT_INT	40017.09	7959.00	173107.50	9573
APC	8.22	6.91	176.75	31091
APSH	15.68	6.84	323.20	31514
BETA	0.83	0.78	0.45	41989
BOR_REPAY	599496.80	41350.00	2429943.00	26245
BORROW_RATIO	101.22	61.13	171.53	29230
BTMV	0.72	0.58	0.96	29933
CA	731792.30	309646.00	1156008.00	27738
CAP_GEARING	33.97	34.13	24.79	31728
CAPS	17.42	4.07	378.60	26266
CASH_EPS	5.33	1.36	121.41	30105
CASH_EQUIV	274399.70	66851.00	539346.00	28405
CASHDIVCOVER	7.29	3.28	12.06	18219
CASHINTCOV	23.45	1.61	1406.59	28288
CASHNAV	0.26	0.16	0.31	26934
CASHNTAV	16.38	0.15	924.14	26352
CASHPS	2.35	0.92	12.24	26934
CASHTBORREP	37.04	1.10	370.44	26044
CASHTCA	0.32	0.22	0.30	23422
CASHTCL	2.75	0.38	8.55	26568
CASHTCRED	2.75	0.38	8.55	26568
CASHTLOANCAP	5.43	0.19	50.74	27688
CASHTNCA	0.46	0.09	1.51	23422
CASHTTD	11.42	0.14	306.97	28610
CCC	77.17	62.45	185.69	23556
CF	339412.30	101041.20	630692.90	30105
CF_MARG	-65.24	12.43	3397.76	30519
CFMTP	-23.04	0.85	1056.66	29175
CFO	299958.40	90481.00	744353.40	24554
CFOBORREP	19.94	2.04	139.99	19801
CFOCASHPS	29.42	1.07	312.40	21567
CFODIVCOVER	10.08	7.30	14.50	13621
CFOLOAN_CAP	1.78	0.34	19.22	21059
CFONAV	0.20	0.20	0.27	23483
CFONTAV	509.62	0.18	27391.03	23143
CFOPS	1.90	1.28	3.51	23483
CFOTCL	0.88	0.69	2.34	21218
CFOTTD	2.86	0.28	53.58	21859
CFT	1.81	0.40	17.55	26531
CFTBOR_REPAY	-0.03	0.00	1.29	24857
CFTP	0.13	0.11	0.19	30030
CFTTOT_DEBT	3.07	0.31	76.99	27435
CH_CASH	29976.26	2996.00	239384.40	24161
CL	552551.80	203558.00	958595.40	27738

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
LNCFMTP	0.05	-0.06	1.27	26991
LNCFO	11.69	11.81	1.80	20809
LNCFTP	-2.18	-2.11	0.87	26790
LNCL	11.94	12.22	1.97	27738
LNCLPS	0.69	0.97	1.57	26254
LNCOGS	12.98	13.34	2.18	26610
LNCREDDAYS	3.93	4.04	0.96	23794
LNCREDTURN	1.97	1.86	0.96	23794
LNCUR_RATIO	0.54	0.45	0.82	27543
LNDEPCN	10.48	10.75	2.19	30371
LNDIVCOVER	1.16	1.19	0.84	16750
LNDY	0.59	0.62	0.80	18948
LNEBIT	11.70	11.74	1.72	26228
LNEBITDA	12.02	12.08	1.68	26620
LNEBITPS	0.27	0.44	1.29	24610
LNEPS	-0.46	-0.26	1.24	23673
LNEY	-2.97	-2.84	0.82	23673
LNINT_EXP	9.97	10.32	2.27	25274
LNINTANG_BS	11.42	11.43	2.30	17465
LNINV_WIP	11.23	11.50	1.95	24431
LNMTBV	0.57	0.54	0.68	29674
LNMV	6.37	6.58	2.08	34245
LNNCA	13.20	13.38	1.93	27703
LNNET_ASSETS	13.06	13.07	1.60	29749
LNNET_DEBT	11.05	11.09	1.75	24989
LNNETCASHFLOW	10.27	10.37	1.99	13729
LNNI_ORDSH	10.94	11.00	1.73	24881
LNNIAT1	11.05	11.09	1.75	25024
LNNIAT2	11.06	11.09	1.67	22477
LNNINAV	-2.22	-2.06	0.87	23565
LNNIPS	-0.38	-0.21	1.29	23523
LNNO_EE	8.36	8.35	1.68	19387
LNNPMTP	-0.76	-0.80	1.38	23856
LNNS	11.34	11.23	1.17	30127
LNNTA	13.09	13.10	1.60	31405
LNOP_PROFIT_ADJ	11.66	11.69	1.68	26782
LNOPMTP	-0.21	-0.26	1.19	25527
LNP	2.19	2.43	1.23	34189
LNPCASHPS	2.80	2.51	1.59	26854
LNPE	2.94	2.81	0.82	23695
LNPEG1	6.25	6.07	1.33	15680
LNPEG2	6.25	6.07	1.33	15680
LNPNAV	0.68	0.62	0.73	29673
LNPNTAV	0.59	0.58	0.70	29024
LNPNTAVROE	3.08	3.15	1.30	22189

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
LNPREF_CAP	11.40	11.99	2.30	10864
LNPSALES	0.22	0.09	1.32	28597
LNPTCA	1.11	1.09	1.05	26174
LNRECDAYS	4.12	4.15	0.74	26049
LNRECTURN	1.78	1.75	0.74	26049
LNRI	6.00	5.88	1.60	34247
LNSCASHPS	2.56	2.52	1.99	25722
LNSNAV	0.45	0.55	1.06	28549
LNSTTD	1.12	1.05	1.30	28343
LNTA_EMPLOY	13.59	13.69	1.75	31680
LNTOT_ASSETS	14.11	14.09	2.01	31751
LNTOT_CE	13.59	13.69	1.75	31680
LNTOT_CRED	11.35	11.61	1.99	26787
LNTOT_DEBTORS	11.46	11.82	2.06	27378
LNTOT_SALES	13.62	13.81	1.97	30566
LNTOTAL_DEBT	12.63	12.94	2.22	28986
LOAN_CAP	1030689.00	380483.00	1670018.00	28058
MA_12	58.59	45.67	53.57	31830
MA_2	14.83	11.34	13.87	34035
MA_3	14.81	11.35	13.82	33814
MA_6	29.52	22.71	27.35	33151
MA_8	39.26	30.30	36.21	32709
MA12	58.59	45.67	53.57	31830
MA2	14.83	11.34	13.87	34035
MA3	14.81	11.35	13.82	33814
MA6	29.52	22.71	27.35	33151
MA8	39.26	30.30	36.21	32709
MTBV	2.81	1.70	30.59	29933
MV	2459.24	722.01	4677.79	34256
MVTRADE	119751.50	23004.66	267625.60	33868
MVTRADEMV	46.86	32.62	110.57	33868
NAV	21.08	6.52	440.02	29899
NCA	2026584.00	645057.00	3333712.00	27738
NCAPS	55.72	8.85	1385.41	26266
NCATEQU	1.72	1.38	1.91	27543
NET_ASSETS	1338208.00	472857.50	2108934.00	29899
NET_DEBT	146712.80	35903.00	386017.20	31548
NETCASHFLOW	30417.93	3210.00	241743.60	23947
NETCASHPS	0.32	0.05	2.75	23531
NETCASHTEBIT	0.14	0.03	21.13	23091
NETCASHTNIAT	0.10	0.05	10.39	16850
NETCASHTTA	0.02	0.00	0.09	23531
NETCASHTTD	-3.27	0.01	170.36	21185
NI_ORDSH	125110.40	32291.00	352096.20	31642
NIAT1	146875.50	35903.00	385731.10	31560

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
NIAT2	201252.70	65364.60	354286.60	22477
NIATTCA	0.04	0.11	1.43	26135
NIATTCL	-0.05	0.17	1.36	26135
NIATTNAV	0.07	0.10	0.30	29744
NIATTTD	3.48	0.12	145.13	27132
NIATTTTA	0.02	0.03	0.10	29744
NICASHPS	2132066.00	46532.81	19885601.00	26779
NINAV	0.07	0.10	0.30	29744
NINTAV	103.53	0.09	6342.22	30081
NIPS	1.34	0.53	20.18	29732
NITNO_EE	31.78	13.62	127.30	19147
NO_EE	12119.30	4234.00	17374.00	19387
NOSH	95321.20	49544.50	130768.30	34256
NP_MARG	-92.46	4.77	3801.38	30566
NPBT	219114.90	53656.00	523587.10	31786
NPBTPOFMARG	-91.20	7.59	3803.80	30530
NPBTPS	2.31	0.81	40.04	29887
NPBTTNAV	0.12	0.15	0.34	29887
NPMTP	-34.39	0.32	1236.09	29201
NS	162130.00	75652.00	225145.30	30139
NTA	1382385.00	485160.00	2206168.00	31537
OBOS3MMA	0.03	0.03	0.01	33814
OBOS6MMA	0.00	0.00	0.00	33151
OP_PROFIT_ADJ	283859.50	82086.00	520230.10	31798
OP_PROFMARG	-93.92	9.77	4319.51	30542
OP_PROFMARGIN2	-80.20	16.39	3794.50	28746
OPMTP	-31.12	0.64	1342.12	29179
ORD_DIV_GROSS	50086.08	4000.00	108152.30	28284
P	15.14	11.35	15.22	34256
PCASHPS	286.28	12.32	2859.28	26878
PCASHPSROE	5605.84	108.29	75173.91	25838
PE	30.99	16.60	63.95	23698
PEG1	18693.03	416.73	984174.20	16133
PEG2	18693.03	416.73	984174.20	16133
PNAV	2.54	1.86	2.40	29812
PNAVROE	22.28	17.15	134.56	28537
PNTAV	2572.74	1.79	155523.70	29144
PNTAV_3M	0.08	0.01	3.43	28478
PNTAV_6M	0.17	0.02	6.20	27812
PNTAVROE	22332.05	16.40	1319366.00	27877
PNTAVROE_3M	0.13	0.00	8.74	27193
PNTAVROE_6M	0.33	-0.01	14.13	26509
POUT	0.20	0.13	0.24	32259
PREF_CAP	109074.50	0.00	263964.10	31625
PRNG	32.88	27.95	23.12	43978

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
PSALES	6.19	1.09	38.62	28612
PTCA	5.27	2.98	9.02	26186
PTNCA	3.64	1.27	10.31	26186
QUICK	1.98	0.96	3.35	27608
RECDAYS	117.69	63.28	1322.08	26049
RECTURN	7.60	5.77	6.67	26049
RETEN	0.80	0.87	0.24	32259
RI	1412.88	356.90	3473.83	34256
RND_IS	107667.80	15820.00	350043.60	6722
RNDTSALES	6.01	0.01	150.37	8685
RNDTTA	0.04	0.01	0.07	9003
ROCE	7.28	7.69	25.60	29818
ROCOMEQU1	0.07	0.10	0.28	31020
ROCOMEQU2	0.13	0.12	0.10	22468
ROE	8.45	10.82	23.17	29944
ROTC1	0.02	0.03	0.10	31513
ROTC2	0.05	0.04	0.05	22456
SALESPS	50.01	11.63	1025.84	28917
SALESTP	208109.30	81937.01	340886.30	29201
SCASHPS	133.94	12.38	721.18	25734
SHARECAP_RES	1453073.00	501329.00	2289152.00	31572
SNAV	2.39	1.72	2.48	28699
SNTAV	2568.36	1.61	151705.20	27974
STCA	2.97	2.63	1.96	26308
STCL	4.32	4.11	2.21	26308
STEQUITY	2.38	1.69	2.52	30035
STNCA	1.88	1.08	2.14	26308
STNO_EE	496.25	276.67	1342.31	18991
STOCK_RATIO	83.46	53.00	434.13	23371
STTD	15.13	2.87	191.13	28343
TA_EMPLOY	2569268.00	878746.00	3997905.00	31728
TAPS	86.46	16.72	1522.78	29887
TATTA	3.98	2.29	5.42	31477
TDPS	23.00	4.56	444.15	27239
TDTNAV	1.03	0.65	1.62	27239
TDTNTAV	826.84	0.60	48477.95	27580
TDTTA	0.27	0.25	0.17	28974
TLCTA	0.22	0.21	0.16	28046
TOT_ASSETS	8677473.00	1321394.00	23918975.00	31751
TOT_CE	2569268.00	878746.00	3997905.00	31728
TOT_CRED	321571.60	110000.00	538915.70	26787
TOT_DEBTORS	352069.30	136159.50	625167.20	27378
TOT_SALES	2959716.00	990142.00	4552569.00	30566
TOTAL_DEBT	1568042.00	415123.00	3442007.00	28986
TV	0.00	0.00	0.00	29749

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
VO	6493.05	2081.20	12009.19	33869
VOLTTRADDAYS	299.88	96.18	554.42	33869
A_TURN_12M	0.06	0.00	0.73	27828
A_TURN_18M	0.08	0.00	1.23	26544
A_TURN_24M	0.10	0.01	1.60	25271
A_TURN_30M	0.12	0.01	1.68	24040
A_TURN_36M	0.13	0.02	1.71	22810
AMORT_INT_12M	0.66	0.13	3.43	7247
AMORT_INT_18M	1.25	0.19	7.39	6610
AMORT_INT_24M	2.00	0.29	10.48	5996
AMORT_INT_30M	2.72	0.44	12.99	5459
AMORT_INT_36M	3.54	0.61	15.40	4970
BOR_REPAY_12M	2.99	0.03	21.65	22984
BOR_REPAY_18M	3.23	0.04	20.34	21767
BOR_REPAY_24M	3.57	0.08	20.41	20582
BOR_REPAY_30M	7.17	0.12	113.32	19421
BOR_REPAY_36M	9.99	0.16	148.30	18270
BORROW_RATIO_12M	0.44	-0.05	5.12	26574
BORROW_RATIO_18M	0.58	-0.04	6.70	24911
BORROW_RATIO_24M	0.75	-0.04	8.29	23649
BORROW_RATIO_30M	0.78	-0.05	7.72	22431
BORROW_RATIO_36M	0.81	-0.05	7.04	21234
BTMV_12M	0.31	-0.03	12.11	27060
BTMV_18M	0.39	-0.04	13.79	25733
BTMV_1M	0.03	-0.01	4.12	29693
BTMV_24M	0.52	-0.05	19.21	24424
BTMV_30M	0.67	-0.06	24.56	23121
BTMV_36M	0.67	-0.06	22.88	21829
BTMV_3M	0.09	-0.02	6.96	29213
BTMV_6M	0.17	-0.02	9.23	28493
CA_12M	0.34	0.09	1.27	25326
CA_18M	0.54	0.14	2.08	24162
CA_24M	0.77	0.22	2.86	23002
CA_30M	1.12	0.28	6.15	21850
CA_36M	1.49	0.38	9.04	20706
CASH_EPS_12M	0.09	0.07	2.91	27445
CASH_EPS_18M	0.10	0.10	4.83	26131
CASH_EPS_24M	0.12	0.14	6.31	24837
CASH_EPS_30M	0.23	0.18	6.31	23553
CASH_EPS_36M	0.35	0.24	6.30	22282
CASH_EQUIV_12M	2.38	0.10	21.09	24971
CASH_EQUIV_18M	3.25	0.18	21.07	23739
CASH_EQUIV_24M	4.19	0.27	21.76	22514
CASH_EQUIV_30M	5.96	0.37	50.15	21331
CASH_EQUIV_36M	7.74	0.53	68.98	20158

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
CCC_12M	0.04	-0.01	0.42	21257
CCC_18M	0.04	-0.01	0.46	20240
CCC_24M	0.04	-0.02	0.47	19238
CCC_30M	0.05	-0.02	0.57	18295
CCC_36M	0.05	-0.02	0.67	17346
CF_12M	0.19	0.11	3.08	27445
CF_18M	0.28	0.16	4.58	26131
CF_24M	0.39	0.23	6.96	24837
CF_30M	0.59	0.30	9.31	23553
CF_36M	0.72	0.39	10.62	22282
CF_MARG_12M	0.02	0.00	2.41	27852
CF_MARG_18M	0.05	0.00	2.84	26568
CF_MARG_24M	0.07	0.00	3.18	25295
CF_MARG_30M	0.13	0.00	3.21	24064
CF_MARG_36M	0.26	0.01	5.10	22834
CFO_12M	0.37	0.07	8.21	21729
CFO_18M	0.59	0.13	9.49	20409
CFO_24M	0.87	0.19	10.75	19097
CFO_30M	1.13	0.27	12.94	17825
CFO_36M	1.54	0.33	15.37	16557
CH_CASH_12M	0.47	-1.09	43.02	20937
CH_CASH_18M	0.24	-1.06	47.05	19245
CH_CASH_24M	0.05	-1.02	50.51	17890
CH_CASH_30M	-0.54	-1.01	44.87	16598
CH_CASH_36M	-1.53	-1.00	32.20	15327
CL_12M	0.32	0.10	1.07	25326
CL_18M	0.52	0.15	3.04	24162
CL_24M	0.74	0.23	4.28	23002
CL_30M	0.97	0.29	5.37	21850
CL_36M	1.21	0.37	6.14	20706
CLPS_12M	0.21	0.05	0.78	23851
CLPS_18M	0.32	0.08	1.20	22693
CLPS_24M	0.43	0.13	1.55	21540
CLPS_30M	0.55	0.16	1.96	20394
CLPS_36M	0.67	0.20	2.24	19264
COGS_12M	0.76	0.10	13.48	24071
COGS_18M	1.18	0.14	17.03	22934
COGS_24M	1.62	0.21	20.06	21818
COGS_30M	1.85	0.28	20.42	20744
COGS_36M	2.05	0.36	19.76	19667
CREDDAYS_12M	0.06	-0.02	0.84	21447
CREDDAYS_18M	0.07	-0.02	0.84	20406
CREDDAYS_24M	0.08	-0.02	0.84	19380
CREDDAYS_30M	0.12	-0.02	1.44	18429
CREDDAYS_36M	0.16	-0.03	1.90	17474

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
CREDTURN_12M	0.60	0.02	18.40	21447
CREDTURN_18M	0.71	0.02	20.80	20406
CREDTURN_24M	0.82	0.02	23.23	19380
CREDTURN_30M	0.72	0.02	18.85	18429
CREDTURN_36M	0.62	0.03	12.13	17474
CUR_RATIO_12M	0.15	0.00	1.13	25134
CUR_RATIO_18M	0.26	0.00	3.20	23970
CUR_RATIO_24M	0.38	0.00	4.74	22811
CUR_RATIO_30M	0.69	-0.01	15.94	21659
CUR_RATIO_36M	1.01	-0.01	23.10	20517
DEBT_DAYS_12M	0.07	-0.01	1.81	22827
DEBT_DAYS_18M	0.09	-0.01	1.95	21682
DEBT_DAYS_24M	0.10	-0.01	2.08	20553
DEBT_DAYS_30M	0.11	-0.02	2.16	19478
DEBT_DAYS_36M	0.12	-0.02	2.33	18424
DEPCN_12M	0.61	0.11	4.53	27775
DEPCN_18M	1.14	0.16	8.01	26480
DEPCN_24M	1.63	0.26	10.18	25211
DEPCN_30M	2.17	0.33	12.60	23945
DEPCN_36M	2.88	0.44	16.08	22683
DIV_PAID_12M	0.66	0.05	12.18	18660
DIV_PAID_18M	0.70	0.09	10.28	17204
DIV_PAID_24M	0.66	0.15	7.04	16417
DIV_PAID_30M	0.63	0.19	5.71	15658
DIV_PAID_36M	0.67	0.23	5.09	14918
DIVCOVER_12M	0.51	0.00	4.58	14130
DIVCOVER_18M	0.55	0.00	3.24	13277
DIVCOVER_24M	0.58	0.00	2.98	12500
DIVCOVER_30M	0.58	0.00	2.72	11786
DIVCOVER_36M	0.62	0.00	2.92	11175
DPS_12M	0.10	0.00	0.30	17143
DPS_18M	0.15	0.00	0.36	16255
DPS_24M	0.20	0.07	0.42	15409
DPS_30M	0.26	0.11	0.51	14610
DPS_36M	0.32	0.14	0.61	13847
DY_12M	0.01	-0.03	0.42	17529
DY_18M	0.04	-0.03	0.48	16273
DY_1M	0.00	0.00	0.12	18862
DY_24M	0.04	-0.05	0.53	15427
DY_30M	0.04	-0.06	0.59	14625
DY_36M	0.04	-0.07	0.63	13866
DY_3M	0.01	-0.01	0.21	18531
DY_6M	0.02	-0.02	0.28	18056
EBIT_12M	1.24	0.08	31.86	28544
EBIT_18M	0.78	0.12	32.13	27230

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
EBIT_24M	9.03	0.17	606.40	25920
EBIT_30M	19.82	0.22	907.50	24624
EBIT_36M	-34.28	0.26	2930.28	23349
EBITDA_12M	0.34	0.11	4.71	27344
EBITDA_18M	0.43	0.15	8.19	26072
EBITDA_24M	0.59	0.22	11.87	24804
EBITDA_30M	0.86	0.27	14.36	23550
EBITDA_36M	0.67	0.34	27.06	22317
EPS_12M	0.64	0.12	4.24	19328
EPS_18M	0.78	0.19	2.99	18039
EPS_1M	0.04	0.00	0.50	23214
EPS_24M	0.93	0.26	2.96	16901
EPS_30M	1.08	0.33	3.21	15917
EPS_36M	1.26	0.40	3.60	15136
EPS_3M	0.13	0.00	0.94	22324
EPS_6M	0.29	0.05	1.73	21193
EPSF_12M	0.64	0.12	4.24	19328
EPSF_18M	0.78	0.19	2.99	18039
EPSF_1M	0.04	0.00	0.50	23214
EPSF_24M	0.93	0.26	2.96	16901
EPSF_30M	1.08	0.33	3.21	15917
EPSF_36M	1.26	0.40	3.60	15136
EPSF_3M	0.13	0.00	0.94	22324
EPSF_6M	0.29	0.05	1.73	21193
EQU_RES_12M	0.23	0.10	0.64	28833
EQU_RES_18M	0.38	0.15	1.21	27519
EQU_RES_24M	0.55	0.25	1.68	26209
EQU_RES_30M	0.73	0.31	2.46	24907
EQU_RES_36M	0.91	0.40	3.13	23613
EY_12M	0.30	-0.07	2.82	21551
EY_18M	0.46	-0.03	2.50	18167
EY_1M	0.03	0.00	0.51	23232
EY_24M	0.45	-0.04	2.49	17048
EY_30M	0.44	-0.05	2.24	16062
EY_36M	0.45	-0.05	2.29	15307
EY_3M	0.11	-0.01	0.90	22329
EY_6M	0.23	-0.01	1.54	21202
GROW1_12M	0.65	-0.05	12.74	16866
GROW1_18M	0.34	-0.07	10.30	16026
GROW1_24M	0.12	-0.09	9.02	15213
GROW1_30M	0.21	-0.11	11.07	14435
GROW1_36M	0.31	-0.13	12.23	13685
GROW2_12M	0.06	-0.06	13.82	17760
GROW2_18M	0.06	-0.10	10.36	16541
GROW2_24M	-0.05	-0.13	15.43	15441

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
GROW2_30M	0.08	-0.15	7.09	14479
GROW2_36M	0.05	-0.17	11.13	13702
INT_EXP_12M	-5.38	0.00	281.46	25784
INT_EXP_18M	-3.31	-0.01	219.07	24550
INT_EXP_24M	-1.48	-0.03	146.67	23345
INT_EXP_30M	1.24	-0.03	191.43	22178
INT_EXP_36M	5.09	0.00	241.90	21045
INTANG_BS_12M	1.51	0.00	12.72	15244
INTANG_BS_18M	2.85	0.04	17.07	14053
INTANG_BS_24M	4.37	0.17	21.41	13068
INTANG_BS_30M	5.98	0.32	25.29	12144
INTANG_BS_36M	7.94	0.51	31.04	11246
INV_WIP_12M	0.20	0.07	0.70	22096
INV_WIP_18M	0.32	0.10	0.99	21022
INV_WIP_24M	0.45	0.16	1.24	19964
INV_WIP_30M	0.91	0.21	12.45	18984
INV_WIP_36M	1.42	0.27	18.07	18008
INVDAYS_12M	0.06	-0.02	0.84	21447
INVDAYS_18M	0.07	-0.02	0.84	20406
INVDAYS_24M	0.08	-0.02	0.84	19380
INVDAYS_30M	0.12	-0.02	1.44	18429
INVDAYS_36M	0.16	-0.03	1.90	17474
INVTURN_12M	0.60	0.02	18.40	21447
INVTURN_18M	0.71	0.02	20.80	20406
INVTURN_24M	0.82	0.02	23.23	19380
INVTURN_30M	0.72	0.02	18.85	18429
INVTURN_36M	0.62	0.03	12.13	17474
LNDY_12M	-0.11	-0.05	2.40	16989
LNDY_18M	-0.16	-0.07	2.49	16110
LNDY_1M	-0.02	0.00	0.70	18779
LNDY_24M	-0.22	-0.10	2.74	15271
LNDY_3M	-0.04	-0.01	1.25	18376
LNDY_6M	-0.05	-0.03	1.74	17900
LNEY_12M	0.04	0.00	0.36	19328
LNEY_18M	0.05	0.01	0.39	18039
LNEY_1M	0.00	0.00	0.08	23214
LNEY_24M	0.06	0.01	0.43	16901
LNEY_3M	0.01	0.00	0.15	22324
LNEY_6M	0.02	0.00	0.25	21193
LNMTBV_12M	-0.09	-0.04	3.04	26611
LNMTBV_18M	-0.11	-0.08	3.46	25282
LNMTBV_1M	-0.01	0.00	0.94	29429
LNMTBV_24M	-0.11	-0.10	3.80	23974
LNMTBV_3M	-0.02	0.00	1.61	28798
LNMTBV_6M	-0.05	-0.02	2.24	28065

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
LNMV_12M	0.05	0.02	0.92	31600
LNMV_18M	0.08	0.03	1.05	30287
LNMV_1M	0.00	0.00	0.14	34021
LNMV_24M	0.10	0.04	1.11	28985
LNMV_30M	0.12	0.05	1.31	27691
LNMV_36M	0.13	0.06	1.41	26406
LNMV_3M	0.01	0.01	0.29	33576
LNMV_6M	0.03	0.01	0.51	32912
LNNET_ASSETS_12M	0.01	0.01	0.03	27028
LNNET_ASSETS_18M	0.02	0.01	0.04	25719
LNNET_ASSETS_24M	0.02	0.02	0.04	24415
LNNET_ASSETS_30M	0.03	0.02	0.05	23125
LNNET_ASSETS_36M	0.03	0.03	0.05	21861
LNNI_ORDSH_12M	0.02	0.01	0.10	20480
LNNI_ORDSH_18M	0.03	0.02	0.11	19281
LNNI_ORDSH_24M	0.04	0.03	0.12	18145
LNNI_ORDSH_30M	0.04	0.03	0.13	17150
LNNI_ORDSH_36M	0.05	0.04	0.13	16219
LNNIAT1_12M	0.02	0.01	0.09	20687
LNNIAT1_18M	0.03	0.02	0.10	19513
LNNIAT1_24M	0.04	0.03	0.11	18398
LNNIAT1_30M	0.04	0.03	0.12	17398
LNNIAT1_36M	0.05	0.04	0.12	16467
LNP_12M	0.02	0.03	1.14	31544
LNP_18M	0.03	0.04	1.53	30181
LNP_1M	0.00	0.00	0.29	33907
LNP_24M	0.05	0.06	1.75	28886
LNP_30M	0.05	0.07	2.04	27592
LNP_36M	0.06	0.09	2.39	26314
LNP_3M	0.01	0.01	0.54	33470
LNP_6M	0.01	0.02	0.76	32803
LNPE_12M	0.04	0.00	0.31	19347
LNPE_18M	0.05	0.01	0.37	18057
LNPE_1M	0.00	0.00	0.08	23238
LNPE_24M	0.06	0.02	0.39	16918
LNPE_30M	0.07	0.02	0.38	15938
LNPE_36M	0.08	0.02	0.38	15153
LNPE_3M	0.01	0.00	0.16	22351
LNPE_6M	0.02	0.00	0.23	21221
LNPEG1_12M	0.03	0.00	0.23	13145
LNPEG1_18M	0.03	0.00	0.25	12219
LNPEG1_1M	0.00	0.00	0.05	15437
LNPEG1_24M	0.04	0.01	0.25	11490
LNPEG1_3M	0.01	0.00	0.10	14968
LNPEG1_6M	0.01	0.00	0.15	14329

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
LNPEG2_12M	0.03	0.00	0.23	13145
LNPEG2_18M	0.03	0.00	0.25	12219
LNPEG2_1M	0.00	0.00	0.05	15437
LNPEG2_24M	0.04	0.01	0.25	11490
LNPEG2_3M	0.01	0.00	0.10	14968
LNPEG2_6M	0.01	0.00	0.15	14329
LNPNAV_12M	0.10	-0.05	13.14	26963
LNPNAV_18M	0.05	-0.08	14.99	25655
LNPNAV_1M	-0.01	0.00	3.11	29445
LNPNAV_24M	-0.04	-0.10	17.71	24357
LNPNAV_3M	0.00	0.00	5.42	28988
LNPNAV_6M	0.03	-0.02	7.18	28304
LNPNTAV_12M	-0.47	-0.04	59.45	26315
LNPNTAV_18M	-0.16	-0.07	11.16	25012
LNPNTAV_24M	0.13	-0.09	36.00	23714
LNPNTAV_3M	0.01	0.00	7.03	28340
LNPNTAV_6M	-0.10	-0.01	13.16	27657
LNPNTAVROE_12M	0.00	0.00	5.79	18021
LNPNTAVROE_18M	0.06	-0.01	5.14	16826
LNPNTAVROE_24M	0.09	-0.01	8.40	15735
LNPNTAVROE_3M	-0.02	0.00	1.81	21115
LNPNTAVROE_6M	-0.02	0.00	2.97	20047
LNPSALES_12M	-0.04	-0.06	7.38	25926
LNPSALES_18M	-0.04	-0.10	9.39	24659
LNPSALES_1M	0.00	0.00	3.48	28371
LNPSALES_24M	-0.11	-0.13	12.26	23406
LNPSALES_3M	0.02	-0.01	3.40	27917
LNPSALES_6M	0.02	-0.02	5.23	27239
LNPTCA_12M	-0.03	-0.01	15.69	23760
LNPTCA_18M	-0.06	-0.02	22.30	22613
LNPTCA_24M	-0.08	-0.03	21.00	21466
LNPTCA_3M	0.02	0.01	6.01	25562
LNPTCA_6M	0.05	0.01	6.57	24951
LNRI_12M	0.02	0.02	0.13	31602
LNRI_18M	0.04	0.03	0.15	30281
LNRI_1M	0.00	0.00	0.03	34018
LNRI_24M	0.05	0.04	0.18	28979
LNRI_30M	0.06	0.05	0.21	27685
LNRI_36M	0.07	0.06	0.23	26403
LNRI_3M	0.01	0.00	0.06	33576
LNRI_6M	0.01	0.01	0.10	32914
MV_12M	0.48	0.15	1.93	31611
MV_18M	0.84	0.24	3.03	30299
MV_1M	0.03	0.01	0.39	34035
MV_24M	1.31	0.34	4.59	28997

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
MV_30M	1.80	0.44	6.08	27703
MV_36M	2.41	0.55	8.76	26418
MV_3M	0.09	0.04	0.70	33593
MV_6M	0.21	0.08	1.16	32930
MVTRADE_12M	3.87	0.20	47.85	31180
MVTRADE_18M	7.76	0.36	89.51	29841
MVTRADE_1M	0.50	-0.01	4.21	33579
MVTRADE_24M	12.96	0.56	174.71	28546
MVTRADE_30M	21.28	0.76	279.09	27268
MVTRADE_36M	32.04	1.01	557.08	26003
MVTRADE_3M	0.98	0.03	16.21	33123
MVTRADE_6M	1.99	0.08	59.63	32462
MVTRADEMV_12M	1.22	0.05	9.34	31180
MVTRADEMV_18M	1.72	0.10	11.86	29841
MVTRADEMV_1M	0.45	-0.01	4.64	33579
MVTRADEMV_24M	2.38	0.17	38.27	28546
MVTRADEMV_30M	2.99	0.23	34.06	27268
MVTRADEMV_36M	3.08	0.29	25.03	26003
MVTRADEMV_3M	0.68	-0.01	9.47	33123
MVTRADEMV_6M	0.92	0.02	8.23	32462
NAV_12M	0.12	0.08	0.40	27243
NAV_18M	0.19	0.11	0.56	25941
NAV_24M	0.27	0.17	0.70	24649
NAV_30M	0.35	0.21	0.95	23365
NAV_36M	0.43	0.26	1.14	22097
NAV_3M	0.03	0.00	0.17	29230
NAV_6M	0.06	0.00	0.26	28561
NET_ASSETS_12M	0.21	0.11	0.56	27243
NET_ASSETS_18M	0.36	0.16	0.99	25941
NET_ASSETS_24M	0.51	0.25	1.34	24649
NET_ASSETS_30M	0.67	0.31	1.91	23365
NET_ASSETS_36M	0.83	0.41	2.36	22097
NET_DEBT_12M	0.56	0.08	22.02	28784
NET_DEBT_18M	0.29	0.11	22.57	27464
NET_DEBT_24M	0.34	0.16	32.92	26165
NET_DEBT_30M	0.90	0.19	42.50	24870
NET_DEBT_36M	-3.35	0.21	276.54	23580
NETCASHFLOW_12M	1.58	-1.08	52.49	21134
NETCASHFLOW_18M	0.29	-1.05	52.51	19557
NETCASHFLOW_24M	-0.90	-1.03	50.36	18274
NETCASHFLOW_30M	-1.07	-1.01	45.19	17002
NETCASHFLOW_36M	-1.82	-1.00	34.72	15746
NI_ORDSH_12M	0.12	0.08	11.16	28974
NI_ORDSH_18M	-0.03	0.11	18.30	27636
NI_ORDSH_24M	0.10	0.15	33.88	26315

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
NI_ORDSH_30M	0.61	0.16	43.29	25007
NI_ORDSH_36M	-3.68	0.19	276.67	23704
NIAT1_12M	0.56	0.08	22.02	28792
NIAT1_18M	0.29	0.11	22.57	27466
NIAT1_24M	0.34	0.16	32.92	26165
NIAT1_30M	0.90	0.19	42.50	24870
NIAT1_36M	-3.35	0.21	276.54	23580
NIPS_12M	0.13	0.04	12.37	26968
NIPS_18M	0.09	0.05	10.66	25660
NIPS_24M	0.11	0.07	9.69	24381
NIPS_30M	0.36	0.09	11.46	23105
NIPS_36M	-0.37	0.11	56.10	21844
NP_MARG_12M	-0.11	-0.06	6.55	27899
NP_MARG_18M	-0.18	-0.07	15.16	26615
NP_MARG_24M	-0.27	-0.10	20.80	25342
NP_MARG_30M	-0.28	-0.13	17.79	24111
NP_MARG_36M	-0.08	-0.14	15.05	22881
NPBT_12M	0.89	0.07	23.74	29118
NPBT_18M	0.14	0.10	25.87	27804
NPBT_24M	6.49	0.14	481.17	26494
NPBT_30M	15.12	0.17	718.36	25192
NPBT_36M	-43.82	0.19	3338.09	23894
NPBTPOFMARG_12M	0.06	-0.05	5.71	27851
NPBTPOFMARG_18M	-0.06	-0.07	8.07	26567
NPBTPOFMARG_24M	-0.16	-0.09	9.76	25294
NPBTPOFMARG_30M	-0.10	-0.11	8.78	24063
NPBTPOFMARG_36M	-0.06	-0.12	9.74	22833
NS_12M	0.12	0.02	1.72	27479
NS_18M	0.16	0.03	1.50	26177
NS_1M	0.01	0.00	0.47	29916
NS_24M	0.20	0.05	1.15	24883
NS_30M	0.24	0.08	1.00	23599
NS_36M	0.26	0.10	0.78	22328
NS_3M	0.03	0.00	0.83	29470
NS_6M	0.06	0.00	1.19	28801
NTA_12M	1409.80	0.10	84671.24	28885
NTA_18M	1563.77	0.14	92141.37	27559
NTA_24M	1913.11	0.24	109499.90	26243
NTA_30M	2014.14	0.31	112347.90	24929
NTA_36M	2125.95	0.40	115418.10	23620
OP_PROFIT_ADJ_12M	-0.06	0.11	9.50	29142
OP_PROFIT_ADJ_18M	0.09	0.14	10.00	27828
OP_PROFIT_ADJ_24M	0.21	0.21	11.29	26518
OP_PROFIT_ADJ_30M	0.14	0.25	12.75	25216
OP_PROFIT_ADJ_36M	0.04	0.29	14.80	23918

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
OP_PROFMARG_12M	-0.07	-0.01	6.99	27875
OP_PROFMARG_18M	0.00	-0.02	5.18	26591
OP_PROFMARG_24M	0.03	-0.03	4.80	25318
OP_PROFMARG_30M	0.06	-0.05	5.65	24087
OP_PROFMARG_36M	0.10	-0.06	6.52	22857
OP_PROFMARGIN2_12M	0.15	0.00	3.95	26041
OP_PROFMARGIN2_18M	0.12	-0.01	3.85	24805
OP_PROFMARGIN2_24M	0.10	-0.01	4.08	23577
OP_PROFMARGIN2_30M	0.09	-0.01	4.13	22388
OP_PROFMARGIN2_36M	0.15	-0.02	5.29	21218
OPMTP_12M	-0.15	-0.15	10.13	26517
OPMTP_18M	-0.08	-0.21	6.46	25239
OPMTP_24M	-0.25	-0.27	9.00	23978
OPMTP_30M	-0.24	-0.31	9.43	22762
OPMTP_36M	-0.19	-0.35	8.12	21551
P_12M	0.26	0.10	0.77	31611
P_18M	0.43	0.16	1.14	30299
P_1M	0.02	0.01	0.14	34035
P_24M	0.62	0.22	1.60	28997
P_30M	0.82	0.28	2.18	27703
P_36M	1.02	0.34	2.80	26418
P_3M	0.05	0.03	0.29	33593
P_6M	0.12	0.05	0.47	32930
PE_12M	0.49	0.01	3.36	19350
PE_18M	0.71	0.03	6.39	18063
PE_1M	0.03	0.00	0.60	23244
PE_24M	0.74	0.04	4.58	16924
PE_30M	0.77	0.05	3.60	15944
PE_36M	0.79	0.05	3.77	15158
PE_3M	0.12	0.01	1.10	22357
PE_6M	0.25	0.01	1.63	21226
PEG1_12M	16.70	-0.03	416.57	13732
PEG1_18M	66.61	-0.03	2875.43	12883
PEG1_1M	0.06	0.00	3.02	15890
PEG1_24M	107.39	-0.01	3265.86	12106
PEG1_30M	89.42	0.00	3842.56	11385
PEG1_36M	69.09	0.02	2917.43	10793
PEG1_3M	1.15	0.00	57.58	15417
PEG1_6M	6.86	-0.01	254.88	14802
PEG2_12M	16.70	-0.03	416.57	13732
PEG2_18M	66.61	-0.03	2875.43	12883
PEG2_1M	0.06	0.00	3.02	15890
PEG2_24M	107.39	-0.01	3265.86	12106
PEG2_30M	89.42	0.00	3842.56	11385
PEG2_36M	69.09	0.02	2917.43	10793

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
PEG2_3M	1.15	0.00	57.58	15417
PEG2_6M	6.86	-0.01	254.88	14802
PNAV_12M	0.14	0.01	0.86	27162
PNAV_18M	0.22	0.02	1.11	25866
PNAV_1M	0.01	0.00	0.18	29589
PNAV_24M	0.28	0.02	1.34	24580
PNAV_30M	0.32	0.03	1.42	23302
PNAV_36M	0.35	0.03	1.56	22039
PNAV_3M	0.03	0.01	0.37	29143
PNAV_6M	0.07	0.01	0.58	28474
PNAVROE_12M	0.34	-0.16	13.84	25815
PNAVROE_18M	0.13	-0.19	17.96	24515
PNAVROE_24M	0.03	-0.23	24.67	23241
PNAVROE_30M	0.08	-0.26	25.96	21990
PNAVROE_36M	0.18	-0.28	20.39	20754
PNAVROE_3M	0.05	0.01	5.88	27850
PNAVROE_6M	0.13	-0.01	9.01	27163
PNTAV_12M	0.38	0.03	11.28	26500
PNTAV_18M	0.45	0.03	11.20	25204
PNTAV_24M	0.49	0.04	11.25	23918
PNTAV_30M	0.52	0.04	11.25	22640
PNTAV_36M	0.66	0.03	16.33	21377
PNTAVROE_12M	0.72	-0.14	22.38	25161
PNTAVROE_18M	0.29	-0.17	21.72	23861
PNTAVROE_24M	-0.08	-0.21	23.99	22587
PNTAVROE_30M	-0.23	-0.23	26.85	21336
PNTAVROE_36M	0.22	-0.27	24.82	20100
PSALES_12M	0.17	0.03	0.84	25949
PSALES_18M	0.27	0.05	1.25	24677
PSALES_24M	0.35	0.05	1.71	23423
PSALES_30M	0.41	0.06	1.98	22216
PSALES_36M	0.49	0.06	2.71	21023
PSALES_3M	0.04	0.01	0.32	27937
PSALES_6M	0.08	0.02	0.51	27262
QUICK_12M	0.20	0.01	1.52	25195
QUICK_18M	0.30	0.00	2.34	24025
QUICK_24M	0.40	0.00	3.11	22871
QUICK_30M	0.50	0.00	4.28	21714
QUICK_36M	0.55	0.00	4.73	20570
RECDAYS_12M	0.10	-0.01	1.05	23619
RECDAYS_18M	0.11	-0.02	1.35	22497
RECDAYS_24M	0.11	-0.02	1.50	21388
RECDAYS_30M	0.11	-0.02	1.53	20303
RECDAYS_36M	0.14	-0.02	2.25	19230
RECTURN_12M	0.16	0.01	1.28	23619

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
RECTURN_18M	0.20	0.02	1.49	22497
RECTURN_24M	0.25	0.02	1.65	21388
RECTURN_30M	0.28	0.02	2.02	20303
RECTURN_36M	0.32	0.02	2.44	19230
RETEN_12M	0.04	0.00	0.41	29610
RETEN_18M	0.07	0.00	0.51	28290
RETEN_24M	0.09	0.00	0.60	26980
RETEN_30M	0.10	0.00	0.65	25672
RETEN_36M	0.11	0.00	0.70	24374
RETEN_6M	0.02	0.00	0.27	30933
RI_12M	0.28	0.13	0.77	31611
RI_18M	0.46	0.19	1.14	30299
RI_1M	0.02	0.01	0.15	34035
RI_24M	0.66	0.27	1.59	28997
RI_30M	0.87	0.34	2.18	27703
RI_36M	1.09	0.43	2.81	26418
RI_3M	0.06	0.03	0.30	33593
RI_6M	0.12	0.06	0.47	32930
RND_IS_12M	0.27	0.11	0.77	5594
RND_IS_18M	0.45	0.18	1.10	5175
RND_IS_24M	0.63	0.30	1.30	4795
RND_IS_30M	0.83	0.39	1.57	4441
RND_IS_36M	1.09	0.48	2.01	4113
ROCE_12M	-0.05	-0.08	3.68	27081
ROCE_18M	-0.11	-0.11	4.99	25773
ROCE_24M	-0.15	-0.14	11.74	24477
ROCE_30M	0.08	-0.16	16.54	23204
ROCE_36M	0.07	-0.20	17.36	21961
ROCOMEQU1_12M	0.00	-0.08	16.02	28258
ROCOMEQU1_18M	-0.01	-0.10	13.06	26938
ROCOMEQU1_24M	-0.05	-0.13	8.47	25642
ROCOMEQU1_30M	0.00	-0.16	8.91	24348
ROCOMEQU1_36M	0.24	-0.20	17.05	23063
ROCOMEQU2_12M	0.46	0.00	3.63	18366
ROCOMEQU2_18M	0.50	0.00	2.73	17122
ROCOMEQU2_24M	0.53	-0.01	2.51	16021
ROCOMEQU2_30M	0.57	-0.02	2.68	15045
ROCOMEQU2_36M	0.63	-0.02	3.01	14263
ROE_12M	0.16	-0.09	9.78	27208
ROE_18M	-0.09	-0.13	9.18	25890
ROE_24M	-0.26	-0.17	10.88	24597
ROE_30M	-0.13	-0.19	12.88	23332
ROE_36M	-0.20	-0.24	12.14	22079
ROTC1_12M	0.00	-0.06	10.73	28737
ROTC1_18M	-0.02	-0.09	8.90	27429

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
ROTC1_24M	-0.05	-0.12	6.18	26130
ROTC1_30M	0.01	-0.15	5.96	24835
ROTC1_36M	-0.08	-0.17	12.73	23549
ROTC2_12M	0.50	0.02	3.95	18344
ROTC2_18M	0.55	0.01	2.85	17106
ROTC2_24M	0.58	0.01	2.63	16006
ROTC2_30M	0.63	0.00	2.80	15024
ROTC2_36M	0.69	0.01	3.11	14239
SALESPS_12M	0.28	0.07	2.84	26233
SALESPS_18M	0.42	0.10	3.53	24955
SALESPS_24M	0.57	0.14	4.05	23692
SALESPS_30M	0.72	0.18	4.47	22479
SALESPS_36M	0.88	0.22	4.79	21278
SALESTP_12M	0.57	0.01	12.71	26539
SALESTP_18M	1.45	0.01	55.51	25261
SALESTP_24M	2.31	0.02	75.58	24000
SALESTP_30M	2.44	0.04	64.29	22784
SALESTP_36M	2.24	0.05	44.21	21573
SHARECAP_RES_12M	0.22	0.10	0.74	28916
SHARECAP_RES_18M	0.38	0.15	1.25	27584
SHARECAP_RES_24M	0.55	0.24	1.69	26268
SHARECAP_RES_30M	0.74	0.30	2.42	24960
SHARECAP_RES_36M	0.94	0.39	3.07	23660
SNAV_12M	0.16	-0.01	2.45	26030
SNAV_18M	0.20	-0.02	2.65	24752
SNAV_24M	0.24	-0.03	2.71	23492
SNAV_30M	0.29	-0.03	3.06	22279
SNAV_36M	0.34	-0.03	3.47	21081
TA_EMPLOY_12M	0.24	0.09	1.01	29075
TA_EMPLOY_18M	0.39	0.14	1.32	27767
TA_EMPLOY_24M	0.55	0.23	1.62	26463
TA_EMPLOY_30M	0.73	0.29	2.15	25167
TA_EMPLOY_36M	0.93	0.39	2.66	23879
TATTA_12M	0.03	-0.01	0.60	28809
TATTA_18M	0.03	-0.01	0.64	27495
TATTA_24M	0.04	-0.01	0.68	26185
TATTA_30M	0.05	-0.01	0.98	24883
TATTA_36M	0.07	-0.01	1.22	23589
TDPS_12M	0.55	0.00	7.15	24439
TDPS_18M	4.24	0.02	203.64	23171
TDPS_24M	8.41	0.07	296.02	21928
TDPS_30M	8.41	0.12	284.59	20698
TDPS_36M	5.60	0.18	207.25	19491
TOT_ASSETS_12M	0.22	0.09	0.52	29083
TOT_ASSETS_18M	0.37	0.13	0.80	27769

A.4. Descriptive Statistics of the Firm-specific Attributes continued..

The table displays the averages of the monthly cross-sectional means, medians and standard deviations of the firm-specific attributes of the S&P TSX Composite Index constituent shares as at 31 July 2005. The statistics are calculated after conducting a winsorisation procedure to crimp outliers. The sample excludes preferences shares, investment trusts. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Mean	Median	Std. Dev.	Observations
TOT_ASSETS_24M	0.52	0.22	1.07	26459
TOT_ASSETS_30M	0.70	0.29	1.49	25157
TOT_ASSETS_36M	0.89	0.39	1.92	23863
TOT_CE_12M	0.24	0.09	1.01	29075
TOT_CE_18M	0.39	0.14	1.32	27767
TOT_CE_24M	0.55	0.23	1.62	26463
TOT_DEBTORS_12M	0.31	0.09	0.99	24953
TOT_DEBTORS_18M	0.49	0.13	1.72	23801
TOT_DEBTORS_24M	0.68	0.20	2.23	22653
TOT_DEBTORS_30M	0.92	0.26	4.73	21502
TOT_DEBTORS_36M	1.22	0.34	7.23	20368
TOT_SALES_12M	0.48	0.10	7.19	27899
TOT_SALES_18M	0.76	0.14	9.63	26615
TOT_SALES_24M	1.05	0.22	11.55	25342
TOT_SALES_30M	1.36	0.27	12.98	24111
TOT_SALES_36M	1.67	0.35	14.13	22881
TOTAL_DEBT_12M	0.63	0.03	7.69	26178
TOTAL_DEBT_18M	4.27	0.07	197.29	24889
TOTAL_DEBT_24M	8.37	0.14	286.34	23629
TOTAL_DEBT_30M	8.67	0.20	282.71	22399
TOTAL_DEBT_36M	6.96	0.28	228.22	21176
TV_12M	1.08	0.05	9.99	27089
TV_18M	1.53	0.10	12.28	25791
TV_1M	0.35	-0.01	3.67	29501
TV_24M	2.05	0.17	38.23	24516
TV_30M	2.41	0.23	22.71	23242
TV_36M	2.76	0.29	26.45	21976
TV_3M	0.58	0.00	12.63	29052
TV_6M	0.78	0.02	8.56	28392
VO_12M	1.52	0.11	12.79	31181
VO_18M	2.36	0.19	16.46	29842
VO_1M	0.46	-0.01	6.37	33579
VO_24M	3.86	0.30	69.97	28547
VO_30M	5.43	0.41	67.27	27269
VO_36M	6.79	0.53	69.89	26004
VO_3M	0.77	0.01	16.85	33123
VO_6M	1.04	0.05	11.82	32463
VOLTTRADDAYS_12M	1.52	0.11	12.79	31181
VOLTTRADDAYS_18M	2.37	0.19	16.59	29842
VOLTTRADDAYS_1M	0.45	-0.01	6.17	33579
VOLTTRADDAYS_24M	3.86	0.30	69.97	28547
VOLTTRADDAYS_30M	5.48	0.41	69.91	27269
VOLTTRADDAYS_36M	6.79	0.53	69.89	26004
VOLTTRADDAYS_3M	0.76	0.01	16.11	33123
VOLTTRADDAYS_6M	1.04	0.05	11.64	32463

Appendix B

B.1. Canadian Stock Exchange S&P Sector and Sub-sector Indexes

The table displays the Toronto Stock Exchange (TSX) sector and Sub-sector indexes as listed by DataStream International. The shortened names of the indices used in this paper are also included. The data were obtained from DataStream International, available at the University of Cape Town.

Raw S&P Indices Collected		
AIRLINES	IT_SERVICES	STEEL
ALUMINUM	IT	SOFTWARE
AUTO_PARTS_&_EQU	LEIS/EQU_&_PROD	SYS_SOFTWARE
BANKS	LIFE/HEALTH_INS_	T/CM_SVS
BIOTEC	LEISURE_PROD	TXT_&_APP
BUILDING_PROD_	MATERIALS	TOBACCO
COMMS_EQ	MACHINERY	TRADING_CO_&DIST
CHEMICALS	H/CARE_DIST	COMM_EQUIPMENT
CONS_MATS	MET_&_MIN	THRFTS/MGE_FIN
CONS_ENGIN_	MOVIES_&_ENT_	TOBACCO
DISTIL_VINT_	MULTI_UTIL_SI	UTILITIES
ENERGY	OIL/GAS_DRILL	CONS_DIS_
ELEC_EQ	OIL/GAS_EQ_&SERV	IN/C_TRUST
ELTRO_EQ/INS	OIL,GAS_&_C_FUEL	CONS_STAPLES
ELEC_MANU_SVS	OIL/GAS_EXP&PROD	ENERGY_IN/C_TRST
ELEC_UTIL_	PHARM/BIOTEC	HEALTH_CARE
CONST_&_FARM_MAC	PROP/CAS_INSUR_	INDUSTRIALS
FOREST_PROD_	PHARM	MATERIALS
FD_PRD	PACKAGED_FOODS	METALS_AND_MINING
FOOD_RETAIL	PREC_METS_&_MINS	REAL_ESTATE
FOOD_DISTRIBUTOR	PUB_&_PRINTING	REIT_INDEX
HOME_FURNISHINGS	H/C_PROV/SVS	TELE/SERVICES
GOLD	PHARMACEUTICALS	UTILITIES
GEN_MER_STORES	REAL_ESTATE	COMPOSITE_INDEX
GAS_UTIL_	ROAD_&_RAIL	60_INDEX
HEALTH_CARE	RETAILING	CANADIAN_ENERGY_INDEX
HH_DUR	S/CON&S/CON_EQ	CANADIAN_FINANCIAL_SERV_
H/CARE_FACIL_	SPECIALTY_STORE	CANADIAN_GOLD_INDEX
HOTELS	SOFT_DRINKS	CANADIAN_INFO_TECH_INDEX
INSURANCE	SEMICONDUCTORS	CANADIAN_MIDCAP_INDEX
INDUSTRIALS	SPEC_FINANCE	CANADIAN_SMALLCAP_INDEX
INDUST_MACHINERY	SPEC_RTL	CAPPED_COMPOSITE_INDEX
INT_OIL_&_GAS	S/W_&_SVS	60_CAPPED_INDEX
INT_SOFTW_/SERV		

B.2. Canadian Stock Exchange DataStream Sector and Sub-sector Indexes

The table displays the Toronto Stock Exchange (TSX) sector and Sub-sector indexes as listed by DataStream International. The shortened names of the indices used in this paper are also included. The data were obtained from DataStream International, available at the University of Cape Town.

Raw DataStream Indices Collected		
AIRLINES_APORTS	GEN__INDUSTRIALS	PERSONAL_PRODUCT
ASSET_MANAGERS	GOLD_MINING	PUBLISH__PRINT_
AUTO_PARTS	RETAIL_HARDLINE	RESOURCES
AUTO_PARTS	HHLD_GDS_TEXTLS	REAL_ESTATE_DEV_
BANKS	HEALTH	REAL_ESTATE
BASIC_INDUSTRIES	HOTELS	RAIL_RD_FREIGHT
BEVERAGES	INF_TECHN_HARDW_	RETAIL__GENERAL
BLDNG_CONS__MATS	INSURANCE_NON-LF	SFTWR_COMP_SERV_
CHEMS__COMMODITY	INSURANCE	RTLRS_SOFT_GOODS
CHEMS_ADV_MATS_	INFORMATION_TECH	SOFTWARE
CHEMICALS	LEISURE_+_HOTELS	SPC_OTH__FINANCE
COMPUTER_SERVICE	LIFE_ASSURANCE	STEEL
CONS__BLDG_MAT_	MED__EQUIP_SUP_	STEEL_OTH_METALS
COMM__VEHICLES	MEDIA__ENTERTAIN	SUB__ENTERTAIN
CYC__CONS__GOODS	OTHER_MINING	SUPPORT_SERVICES
CYCLICAL_SERVICE	OTHER_FINANCIAL	TELECOM_SERVICES
DISTIL__VINTNERS	MINING	TELECOM_EQUIPMNT
ELECTRICITY	RETAILERS-DEPT_	TELECOM_FXD_LINE
ELECTRONIC_EQUIP	NON_CYC_CONS_GDS	TELECOM_WIRELESS
ELECTR__EQUIP_	NON_CYC_SERVICES	TELECOM_MEDIA_IT
ENG__CONTRACTORS	NON-FERR__METALS	TOBACCO
ENG__MACHINERY	OIL_GAS_EXP_PROD	FINANCIALS
ENG__GENERAL	OIL_GAS	NON-FINANCIAL
FOOD_PROCESSORS	OIL_INTEGRATED	NON-FIN_EX_RESOR
FOOD_DRUG_RETLRS	OIL_SERVICES	MARKET
FOOD_PRDR_/PRCR_	OTHER_CONSTRUCTN	DS-MARKET_EX_TMT
FORESTRY	OTHER_INSURANCE	TRANSPORT
FORESTRY_PAPER	PAPER	TV__RADIO__FILM
FURN__FLOORCOV_	PER_CARE_HSHLD	OTHER_UTILITIES
GAS_DISTRIBUTION	PHARM__BIOTECH	UTILITIES
	PHARMACEUTICALS	

B.3. Canadian Stock Exchange Sector and Sub-sector Indexes

The table displays the Canadian Stock Exchange (TSX) sector and Sub-sector indexes as listed by DataStream International. DataStream International uses hierarchical classification structure for levels one to six. Also included is the S&P TSX Composite Index. The necessary data were obtained from DataStream International, available at the University of Cape Town. The table below provides a brief summary.

Level 1	Market Data
Level 2	Non-Financials Non-Financials excluding Resources Resources Financials
Level 3	Basic Industries Cyclical Consumer Goods Cyclical Services General Industrials Information Technology Non-cyclical Consumer Goods Non-cyclical Services Resources Financials Utilities
Level 4	Comprises up to 39 sub sectors of level three.
Level 5	Comprises up to 11 sub-sectors of level four.
Level 6	Level 6 sectors are devised by Datastream where it is belived that more detailed descriptions of levels 4 an 5 are appropriate

B.4. Canadian Stock Exchange Sector and Sub-sector Indexes

The table displays the Canadian Stock Exchange (TSX) sector and Sub-sector indexes as listed by DataStream International. DataStream International uses hierarchical classification structure for levels one to six. Also included is the S&P TSX Composite Index. The necessary data were obtained from DataStream International, available at the University of Cape Town. The table below provides a summary of level three and four..

Level 3	Level 4		
Aerospace & Defense	Aerospace	Food & Drug Retailers	Other Mineral Extractors
Automobiles & Parts	Airlines & Airports	Food Processors	Paper
Banks	Asset Managers	Footwear	Personal Products
Beverages	Auto Parts	Forestry	Pharmaceuticals
Chemicals	Automobiles	Furnishings & Floor coverings	Photography
Construction & Building Materials	Banks	Gambling	Property Agencies
Diversified Industrials	Biotechnology	Gas Distribution	Publishing & Printing
Electricity	Brewers	Gold Mining	Rail, Road & Freight
Electronic & Electrical Equipment	Builders Merchants	Health Maintenance Organisations	Real Estate Development
Engineering & Machinery	Building & Construction Materials	Hospital Management	Real Estate Inv. Trusts
Food & Drug Retailers	Business Support Services	Hotels	Re-insurance
Food Producers & Processors	Chemicals Speciality	House Building	Restaurants & Pubs
Forestry & Paper	Chemicals, Advanced Materials	Household Appliances & Housewares	Retailers Multi Department
Health	Chemicals, Commodity	Household Products	Retailers, E-Commerce
Household Goods and Textiles	Clothing & Footwear	Insurance Brokers	Retailers, Hardlines
nformation Technology, Hardware	Commercial Vehicles	Insurance, Non-Life	Retailers-Soft Goods
Insurance	Computer Hardware	Internet	Security & Alarm
Investment Companies	Computer Services	Investment Banks	Semiconductors
Leisure and Hotels	Consumer Electronics	Investment Companies	Shipping & Ports
Life Assurance	Consumer Finance	Leisure Equipment	Soft Drinks
Media and Entertainment	Defence	Leisure Facilities	Software
Mining	Delivery Services	Life Assurance	Steel
Oil & Gas	Discount & Super Stores & Warehouses	Media Agencies	Subscription Entertainment Networks
ersonal Care & Household Produc	Distillers & Vintners	Medical Equipment & Supplies	Telecom Equipment
Pharmaceuticals -	Diversified Industrials	Mining Finance	Telecom Wireless
Real Estate	Education, Training	Mortgage Finance	Telecom, Fixed Line
Retailers,	Electrical Equipment	Networks	Television, Radio and Filmed Entertainment
Software & Computer Services	Electricity	Non-Ferrous Metals	Textiles & Leather
Speciality & Other Finance	Electronic Equipment	Oil & Gas Exploration & Production	Tobacco
Steel & Other Metals	Eng. Contractors	Oil Integrated	Transaction and Payroll Services
Support Sevices	Eng. Fabricators	Oil Services	Tyres & Rubber
Telecom Services	Eng. General	Other Construction	Vehicle Distribution
Tobacco	Environmental Control	Other Financial	Water
Transport	Farming & Fishing	Other Health Care	
Utilities, Other	Floor coverings	Other Insurance	

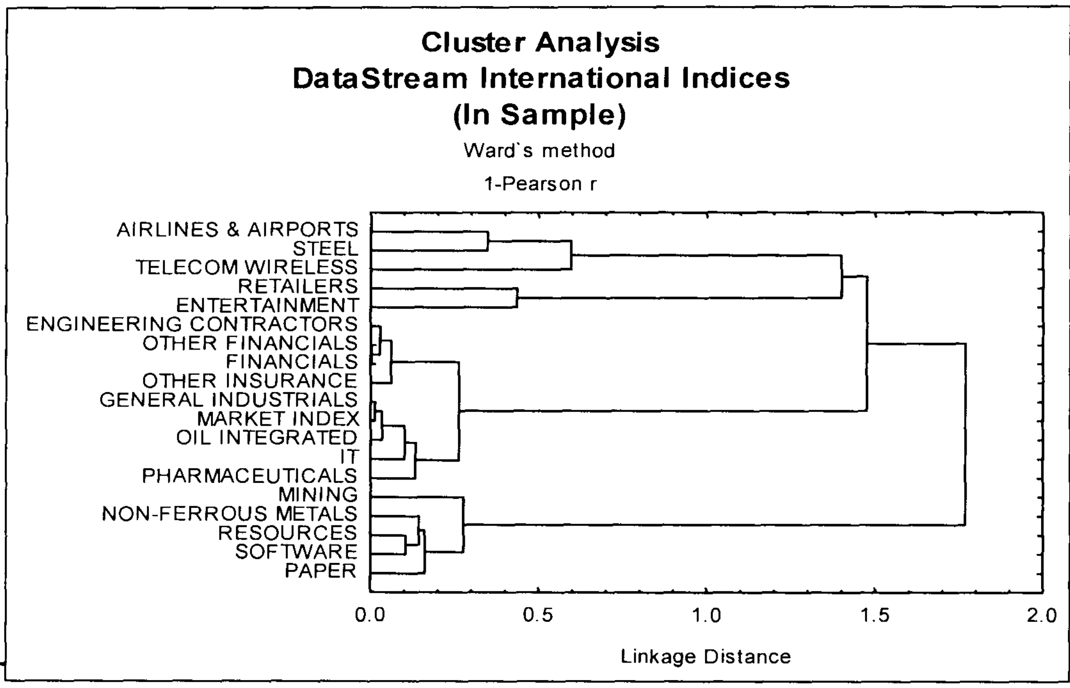
B.5. Canadian Stock Exchange Sector and Sub-sector Indexes

The table displays the Canadian Stock Exchange (TSX) sector and Sub-sector indexes as listed by DataStream International. DataStream International uses hierarchical classification structure for levels one to six. Also included is the S&P TSX Composite Index. The necessary data were obtained from DataStream International, available at the University of Cape Town. The table below provides a summary of level six.

Level 6			
Gold Mining	Household Appliances & Housewares	Environmental Control	Housing Income Investment Trusts
Mining Finance	Leisure Equipment	Transaction and Payroll Services	Open Ended Investment Companies
Other Mineral Extractors	Textiles & Leather	Security & Alarm	Offshore Funds
Oil & Gas Exploration & Production	Brewers	Airlines & Airports	Venture Capital Trusts
Oil Services	Distillers & Vintners	Rail, Road & Freight	Currency Funds
Oil Integrated	Soft Drinks	Shipping & Ports	Investment Trusts, Other
Chemicals, Commodity	Farming & Fishing	Food & Drug Retailers	Split Capital Investment Trusts
Chemicals, Advanced Materials	Food Processors	Telecom, Fixed Line	Authorised Unit Trusts
Chemicals, Speciality	Health Maintenance Organisations	Telecom Wireless	Insurance & Property Funds
Builders Merchants	Hospital Management	Electricity	Mutual Funds
Building & Construction Materials	Medical Equipment & Supplies	Gas Distribution	Money Market Funds
House Building	Other Health Care	Water	Unclassified
Other Construction	Household Products	Computer Hardware	Unquoted equities
Forestry	Personal Products	Semiconductors	Other Equities
Paper	Biotechnology	Telecom Equipment	Equity Warrants
Non-Ferrous Metals	Pharmaceuticals	Computer Services	Other Warrants
Steel	Tobacco	Internet	Interest Rate Futures
Aerospace	Discount & Super Stores & Warehouses	Software	Fixed Interest Futures
Defence	Retailers, E-Commerce	Banks	Currency Futures
Diversified Industrials	Retailers, Hardlines	Insurance Brokers	Stock Index Futures
Electrical Equipment	Retailers Multi Department	Insurance, Non-Life	Commodity Futures
Electronic Equipment	Retailers-Soft Goods	Re-insurance	Options
Commercial Vehicles	Gambling	Other Insurance	Options Written
Eng. Contractors	Hotels	Life Assurance	Real Commodities
Eng. Fabricators	Leisure Facilities	Investment Companies	Commodity Unit Trusts
Eng. General	Restaurants & Pubs	Inv. Trust International	Real Property
Automobiles	Television, Radio and Filmed Entertainment	Real Estate Development	Property Unit Trust
Auto Parts	Subscription Entertainment Networks	Property Agencies	Suspended Equities
Tyres & Rubber	Networks	Real Estate Inv. Trusts	Other Investments
Vehicle Distribution	Media Agencies	Asset Managers	Building Society Deposit
Clothing & Footwear	Photography	Consumer Finance	Local Authority Deposit
Footwear	Publishing & Printing	Investment Banks	Cash
Furnishings & Floor coverings	Business Support Services	Mortgage Finance	Discounted Bills
Floor coverings	Delivery Services	Other Financial	Certs of Deposits
Consumer Electronics	Education , Training	Exchange Traded Funds	Other Liquid Assets

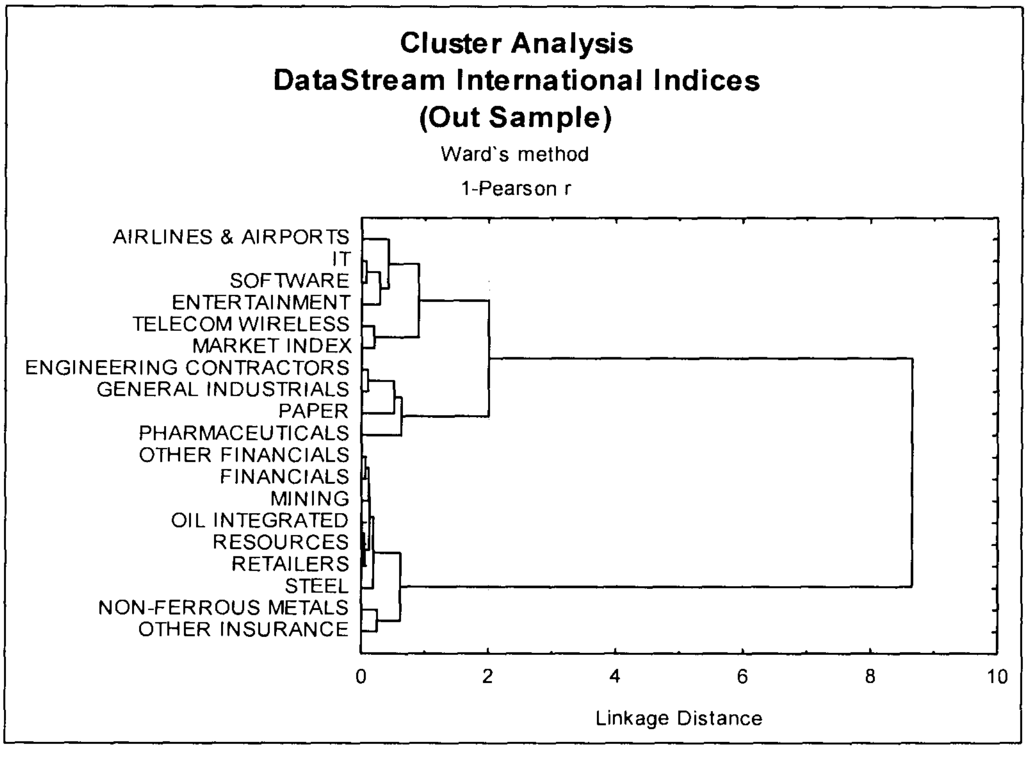
B.6. Vertical Tree Diagram of Cluster Analysis Results for DataStream Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 18 DataStream International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 December 2000. The necessary data were obtained from DataStream International, available at the University of Cape Town . Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3. for the full names of the indices.



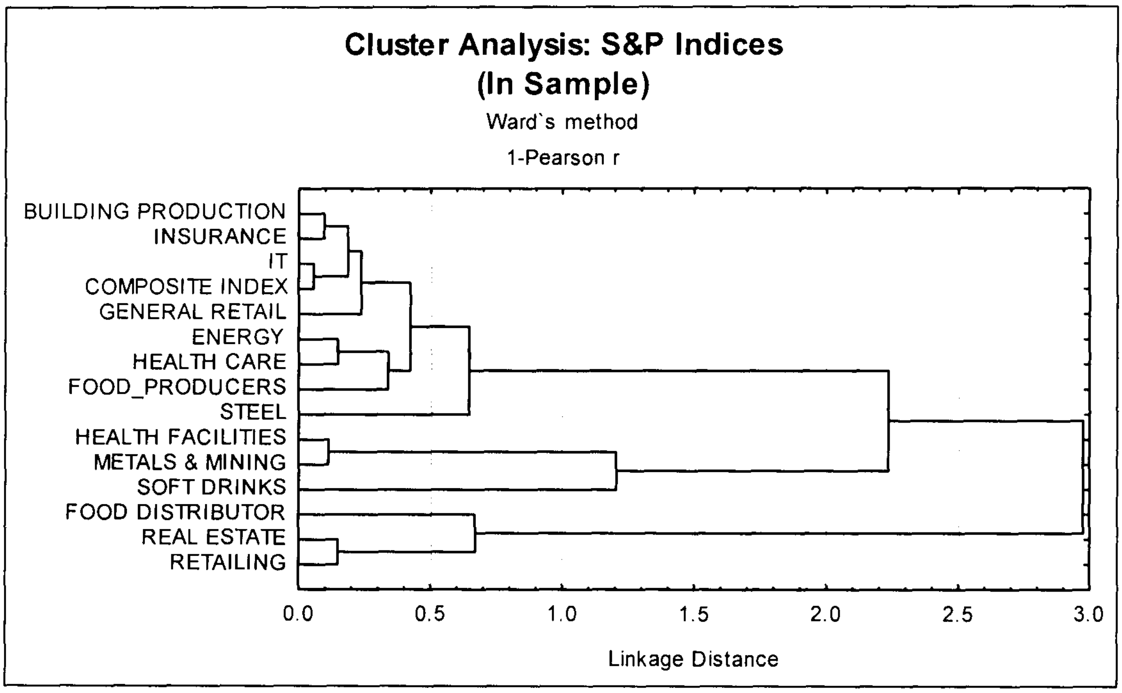
B.7. Vertical Tree Diagram of Cluster Analysis Results for DataStream Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 18 DataStream International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 1 January 2000 to 31 December 2000. The necessary data were obtained from DataStream International, available at the University of Cape Town. Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3. for the full names of the indices.



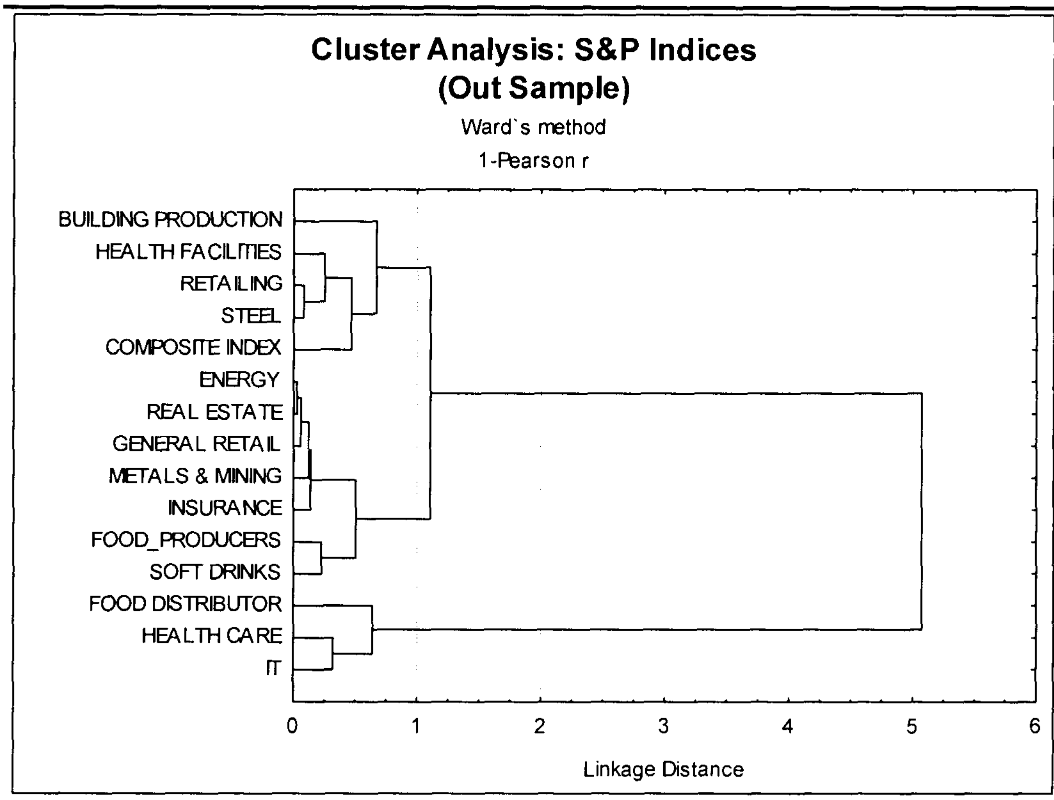
B.8. Vertical Tree Diagram of Cluster Analysis Results for S&P Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 15 S&P International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 December 2000 The necessary data were obtained from DataStream International, available at the University of Cape Town. Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3. for the full names of the indices.



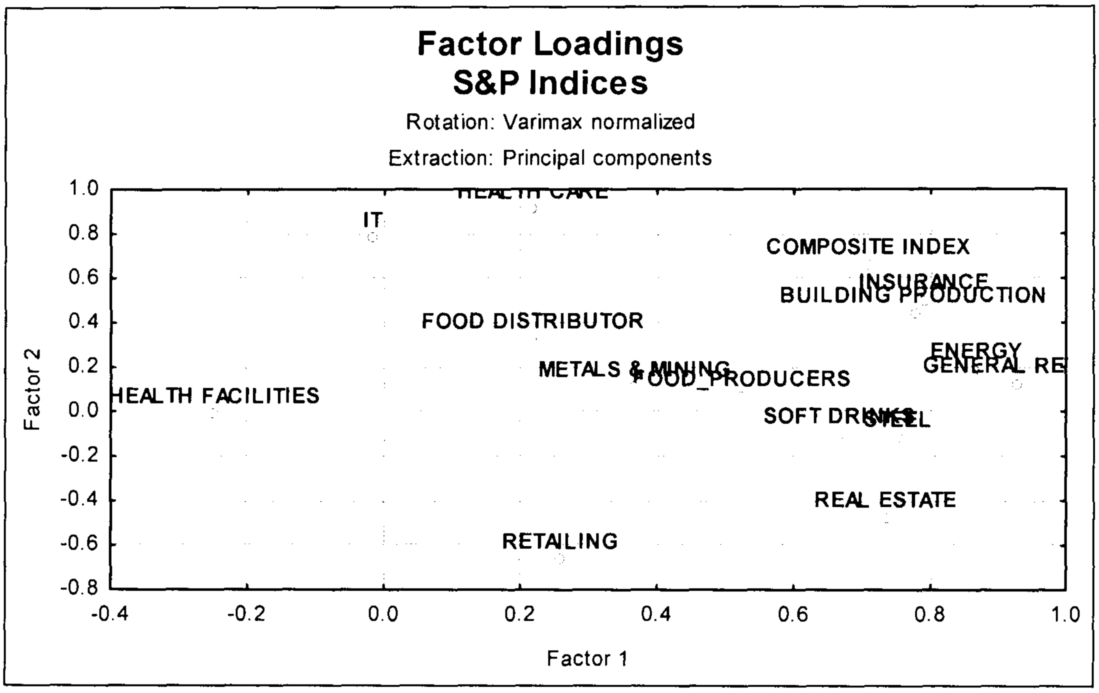
B.9. Vertical Tree Diagram of Cluster Analysis Results for S&P Indices

Vertical tree diagram showing the hierarchical cluster analysis of total monthly returns of 15 S&P International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005. The necessary data were obtained from DataStream International, available at the University of Cape Town. Clusters are extracted based on Ward's linkage rule. The smaller the linkage distance, the more "similar" the indices are in nature. Refer to Table 5.3. for the full names of the indices.



B.10. Factor Loadings Plot for S&P Indices

The factor loadings plot presents the first two derived factors shown as the x and y axis. The plot shows the correlations between each index and the factor. The two dimensional plot allows for inspection of the dichotomous market structure of the Canadian Market. The factors are derived using varimax rotation. The total monthly returns of 15 S&P International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005 make up the data set. The necessary data were obtained from DataStream International, available at the University of Cape Town.



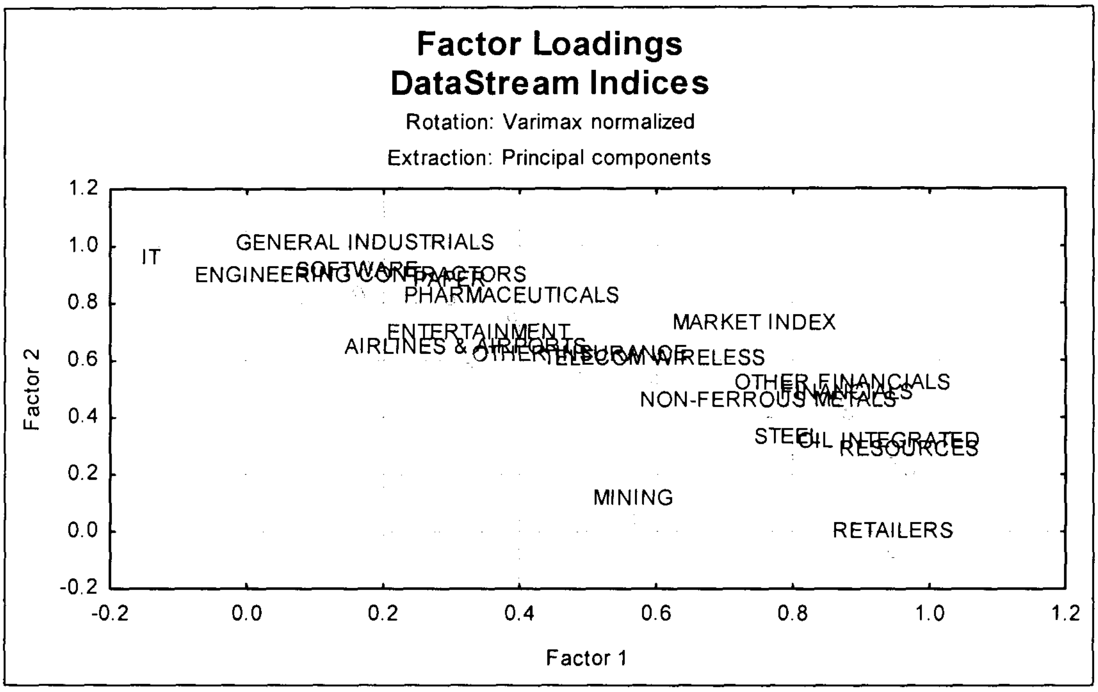
B.11. Factor Loadings Plot for S&P Indices

The factor loadings table presents shows the correlations between each index and the factor. Correlations are inspected and used to indicate which indices are best suited as proxies for the APT model. The factors are derived using varimax rotation. The total monthly returns of 15 S&P International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005 make up the data set. The necessary data were obtained from DataStream International, available at the University of Cape Town. Highly correlated indices are highlighted.

Index	Factor 1	Factor 2	Factor 3	Factor 4
BUILDING PRODUCTION	0.50	0.60	0.11	0.46
ENERGY	0.93	0.25	0.07	0.12
FOOD_PRODUCERS	0.06	0.28	0.33	0.76
FOOD DISTRIBUTOR	0.02	0.45	-0.66	0.21
GENERAL RETAIL	0.77	0.29	-0.07	0.45
HEALTH CARE	0.08	0.93	0.14	-0.04
HEALTH FACILITIES	-0.52	0.02	0.78	0.28
INSURANCE	0.57	0.65	0.06	0.37
IT	-0.16	0.81	-0.26	-0.06
METALS & MINING	0.32	0.12	0.84	0.13
REAL ESTATE	0.65	-0.32	-0.33	0.49
RETAILING	-0.14	-0.43	-0.28	0.82
SOFT DRINKS	0.91	-0.12	0.12	-0.08
STEEL	0.37	0.11	0.13	0.78
COMPOSITE INDEX	0.65	0.73	-0.04	0.09

B.12. Factor Loadings Plot for DataStream Indices

The factor loadings plot presents the first two derived factors shown as the x and y axis. The plot shows the correlations between each index and the factor. The two dimensional plot allows for inspection of the dichotomous market structure of the Canadian Market. The factors are derived using varimax rotation. The total monthly returns of 18 DataStream International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005 make up the data set. The necessary data were obtained from DataStream International, available at the University of Cape Town.



B.13. Factor Loadings Plot for DataStream Indices

The factor loadings table presents shows the correlations between each index and the factor. Correlations are inspected and used to indicate which indices are best suited as proxies for the APT model. The factors are derived using varimax rotation. The total monthly returns of 18 DataStream International sector and sub-sector indexes for the Toronto Stock Exchange (TSX) over the period, 31 January 1989 to 31 July 2005 make up the data set. The necessary data were obtained from DataStream International, available at the University of Cape Town. Highly correlated indices are highlighted.

Index	Factor 1	Factor 2	Factor 3	Factor 4
AIRLINES & AIRPORTS	0.42	0.34	0.45	-0.43
ENGINEERING CONTRACTORS	0.10	0.89	0.26	0.12
GENERAL INDUSTRIALS	0.19	0.74	0.57	-0.16
IT	-0.12	0.43	0.84	-0.05
OTHER FINANCIALS	0.87	0.41	0.22	0.03
MINING	0.37	0.18	-0.06	0.88
NON-FERROUS METALS	0.67	0.38	0.19	0.46
OIL INTEGRATED	0.96	0.21	0.14	0.01
OTHER INSURANCE	0.40	0.82	-0.06	0.20
PAPER	0.23	0.74	0.41	0.21
PHARMACEUTICALS	0.39	0.73	0.32	-0.09
RESOURCES	0.94	0.21	0.11	0.21
RETAILERS	0.96	-0.13	0.04	0.11
SOFTWARE	0.08	0.53	0.69	0.40
STEEL	0.76	0.26	0.12	0.21
ENTERTAINMENT	0.39	0.11	0.80	-0.06
TELECOM WIRELESS	0.65	0.09	0.69	-0.06
FINANCIALS	0.88	0.42	0.16	0.01
MARKET INDEX	0.74	0.52	0.41	0.04

B.14. S&P Single and Multi-index Models tests for the In sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the S&P TSX Composite Index. The APT factor indices used are (1) Energy; (2) IT; (3) Metals & Minerals; and (4) Retailing.

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSIONs SIGNIFICANT AT 5%
Single-index Model	0.14	0.12	0.07	0.76
Multi-index residuals on single-index model	0.02	0.003	0.45	0.15
Multi-index model	0.22	0.16	0.09	0.72
Single-index residuals on Multi-index model	0.16	0.08	0.27	0.37

B.15. S&P Single and Multi-index Models tests for the Out sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the S&P TSX Composite Index. The APT factor indices used are (1) Energy; (2) IT; (3) Metals & Minerals; and (4) Retailing.

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSIONs SIGNIFICANT AT 5%
Single-index Model	0.09	0.07	0.18	0.51
Multi-index residuals on single-index model	0.01	-0.002	0.48	0.04
Multi-index model	0.24	0.18	0.09	0.66
Single-index residuals on Multi-index model	0.19	0.12	0.17	0.52

B.16. DataStream Single and Multi-index Models tests for the In sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the DataStream Market Index. The APT factor indices used are (1) Oil Integrated; (2) Engineering contractors; (3) IT; and (4) Mining.

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSIONs SIGNIFICANT AT 5%
Single-index Model	0.13	0.12	0.08	0.75
Multi-index residuals on single-index model	0.03	0.015	0.37	0.25
Multi-index model	0.21	0.16	0.10	0.71
Single-index residuals on Multi-index model	0.15	0.08	0.32	0.28

B.17. DataStream Single and Multi-index Models tests for the Out sample period

The table displays the mean of R^2, R^2-adjusted and p-values for the time series regressions across the companies. Excess returns for single and multifactor models are calculated by subtracting the monthly risk-free return from the raw unadjusted share return. The market premium and APT factor excess returns are calculated by subtracting the monthly risk-free return from the single-index model's proxy and the APT indices raw return. The three month Bankers acceptance rate is used as the risk-free rate and the single-index model's proxy is the DataStream Market Index. The APT factor indices used are (1) Oil Integrated; (2) Engineering Contractors; (3) IT; and (4) Mining.

REGRESSION	MEAN R^2	MEAN ADJUSTED R^2	MEAN P VALUE OF REGRESSION	% REGRESSION SIGNIFICANT AT 5%
Single-index Model	0.09	0.07	0.17	0.52
Multi-index residuals on single-index model	0.01	0.00016	0.46	0.05
Multi-index model	0.21	0.15	0.13	0.55
Single-index residuals on Multi-index model	0.17	0.10	0.22	0.41

Appendix C

C.1. Nonstandardised versus Standardised Attributes Results

The standardisation procedure yields a cross sectional mean of zero and a standard deviation of one for every month for each attribute. This allows for the cross sectional regression coefficients to be compared with each other and used for further testing. The standardisation methodology follows that of van Rensburg and Robertson (2003).

The standardising of the style characteristics data for the univariate cross-sectional regressions does affect the results of the tests. The methodology in this study first calculates monthly slopes, and then finds the t-statistic value to test the null hypothesis that the mean of these monthly slopes is significantly different from zero. The adjusted values to the attribute can create different monthly slopes' values and hence varying t-statistics for the standardised and nonstandardised datasets.

The standardising procedure, however, allows for direct comparison between the magnitudes of the slopes of the various characteristics and becomes a necessary part of the cross sectional regression methodology.

The standardised and nonstandardised t-statistics for the unadjusted returns sample are shown in Appendix C.1.1 for evaluation purposes. The attributes show the same relationship (positive or inverse) with returns before and after standardisation.

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C.2. Non-standardised versus Standardised Attributes: Cross-sectional Regression Results

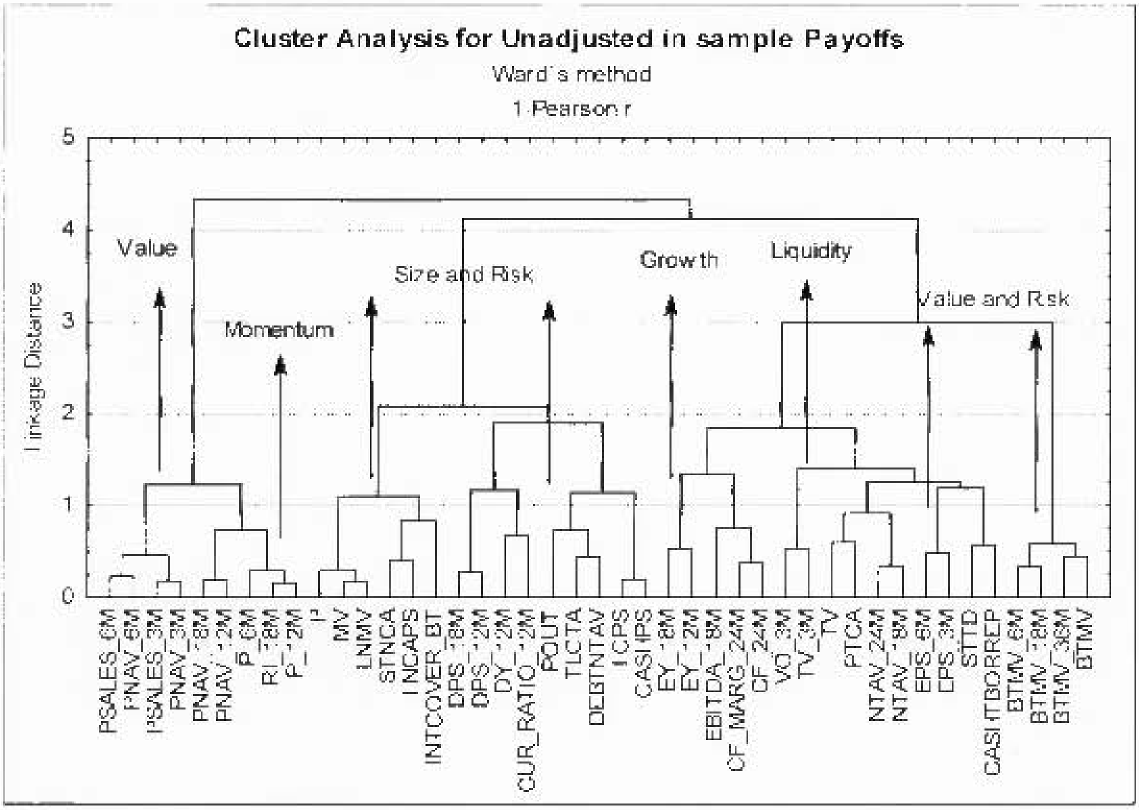
Univariate cross sectional regressions of firm-specific attributes on total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The average monthly coefficient for each attribute is tested for significance using Student's (1908) t-statistic. The table shows these statistics for regressions performed on a standardised and non standardised set of attributes. Figures highlighted and in bold indicate significance at the 5% level. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	T statistic (Standardised)	Attribute	T statistic (Non Standardised)
P	Size	**-7.44**	P	**-7.32**
LNCAPS	Size	**-6.37**	LNCAPS	**-6.36**
NTAV_18M	Value	**6.28**	NTAV_18M	**6.31**
PNAV_12M	Value	**6.08**	PNAV_12M	**6.24**
EPS	Size	**-5.19**	EPS	**-5.39**
POUT	Growth	**-5.08**	POUT	**-4.69**
NTAV_24M	Value	**5.02**	NTAV_24M	**5.24**
LNMV	Size	**-4.80**	LNMV	**-4.79**
P_12M	Momentum	**4.47**	P_12M	**4.00**
VO_3M	Liquidity	**4.38**	VO_3M	**3.27**
MV	Size	**-4.26**	MV	**-4.08**
TV_3M	Liquidity	**3.89**	TV_3M	**2.25**
PNAV_18M	Value	**3.87**	PNAV_18M	**3.84**
PSALES_6M	Value	**3.63**	PSALES_6M	**3.82**
CASHPS	Size	**-3.24**	CASHPS	**-3.75**
INTCOVER_BT	Risk	**3.00**	INTCOVER_BT	**2.59**
PSALES_3M	Value	**3.00**	PSALES_3M	**3.24**
PNAV_6M	Value	**2.94**	PNAV_6M	**3.27**
BTMV_18M	Value	**2.80**	BTMV_18M	**2.42**
LCPS	Size	**-2.78**	LCPS	**-4.06**
DEBTNTAV	Risk	**-2.73**	DEBTNTAV	**-2.74**
TV_1M	Liquidity	**2.66**	TV_1M	**2.87**
PNTAV	Value	**-2.66**	PNTAV	**-3.01**
RI_18M	Momentum	**2.43**	RI_18M	1.59
TLCTA	Risk	**-2.39**	TLCTA	**-2.41**
EPS_3M	Growth	**2.39**	EPS_3M	1.80
NPBT_18M	Growth	**2.32**	NPBT_18M	**2.57**
PTCA	Value	**2.28**	PTCA	**2.64**
P_6M	Momentum	**2.22**	P_6M	**2.08**
BTMV	Value	**2.18**	BTMV	**3.16**
CFOPS	Size	**-2.11**	CFOPS	-0.32
DPS_12M	Growth	**2.08**	DPS_12M	1.69
BORROW_RATIO	Risk	**-2.07**	BORROW_RATIO	-1.60
DPS_18M	Growth	**2.02**	DPS_18M	**2.00**
STCL	Risk	**-1.99**	STCL	**-2.06**
BOR_REPAY_24M	Growth	-1.73	BOR_REPAY_24M	0.23
TDTTA	Risk	-1.65	TDTTA	-1.62
STTD	Risk	1.59	STTD	**2.49**
TV	Liquidity	1.38	TV	**2.28**
LNCFTP	Size	-0.08	LNCFTP	-0.13

Only 5 attributes are rendered insignificant under none standardisation. RI_18M, EPS_3M, CFOPS, DPS_12M and Borrow ratio are found to be marginally insignificant after the application of students T test on none standardised attributes.

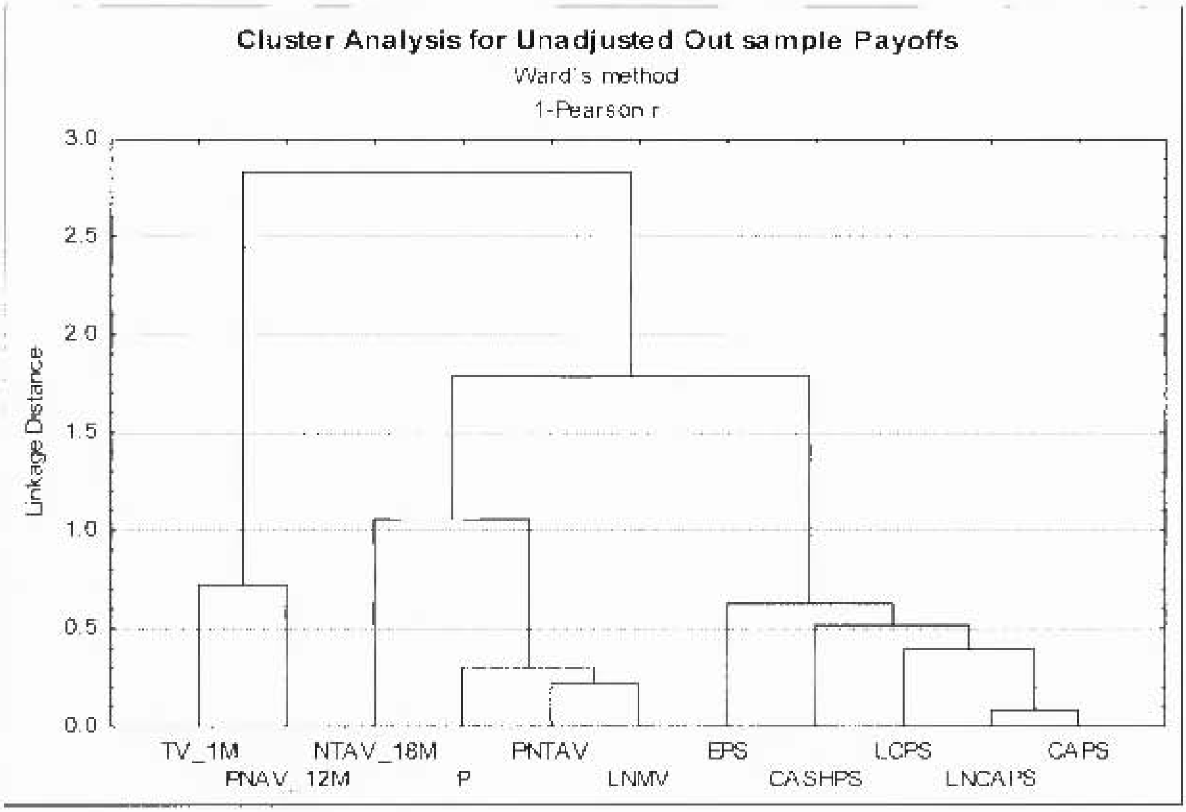
C.2. Tree Diagram of Clusters of Monthly In sample Payoffs: Unadjusted Returns

The horizontal tree diagram showing the hierarchical cluster analysis of monthly coefficients to standardised firm-specific attributes as calculated from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 December 2000. Only attributes with an average of monthly coefficients significant at the 5% level in a Student's (1908) t test are included. The data were extracted from DataStream International, available at the University of Cape Town. Ward's method is used for clustering. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



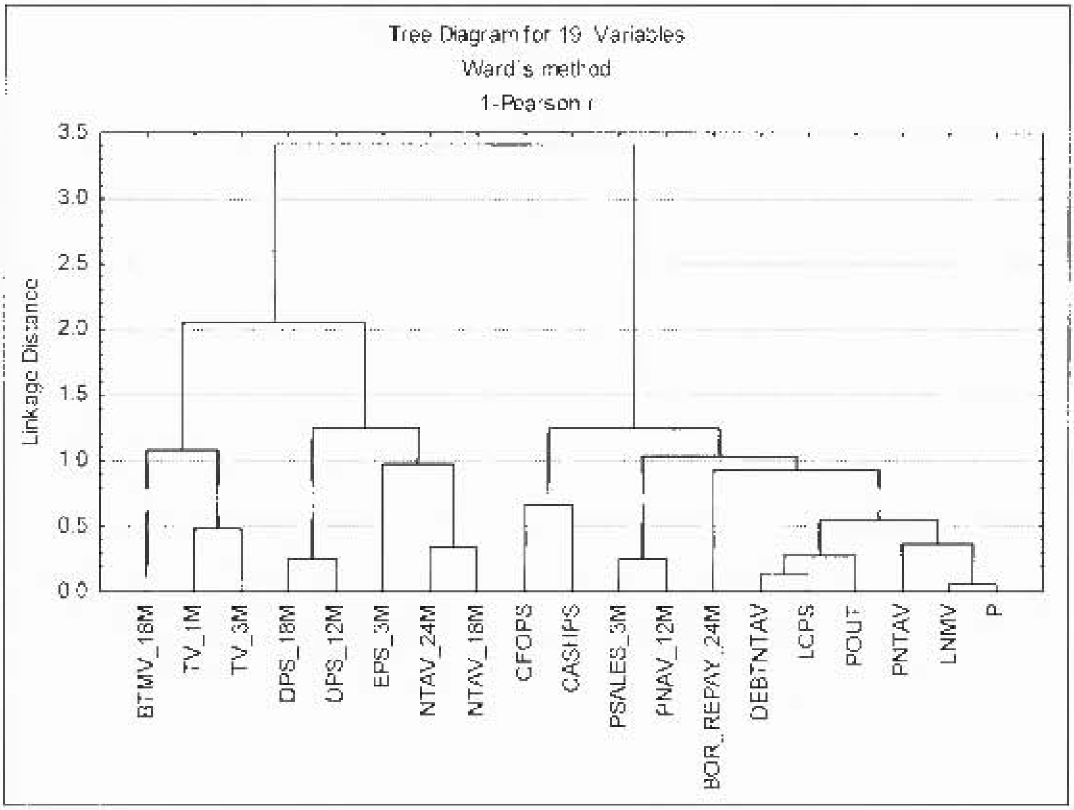
C.3. Tree Diagram of Clusters of Monthly Out Sample Payoffs: Unadjusted Returns

The horizontal tree diagram showing the hierarchical cluster analysis of monthly coefficients to standardised firm-specific attributes as calculated from univariate cross sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 2000 to 31 July 2005. Only attributes with an average of monthly coefficients significant at the 5% level in a Student's (1908) t-test are included. The data were extracted from DataStream International, available at the University of Cape Town. Ward's method is used for clustering. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



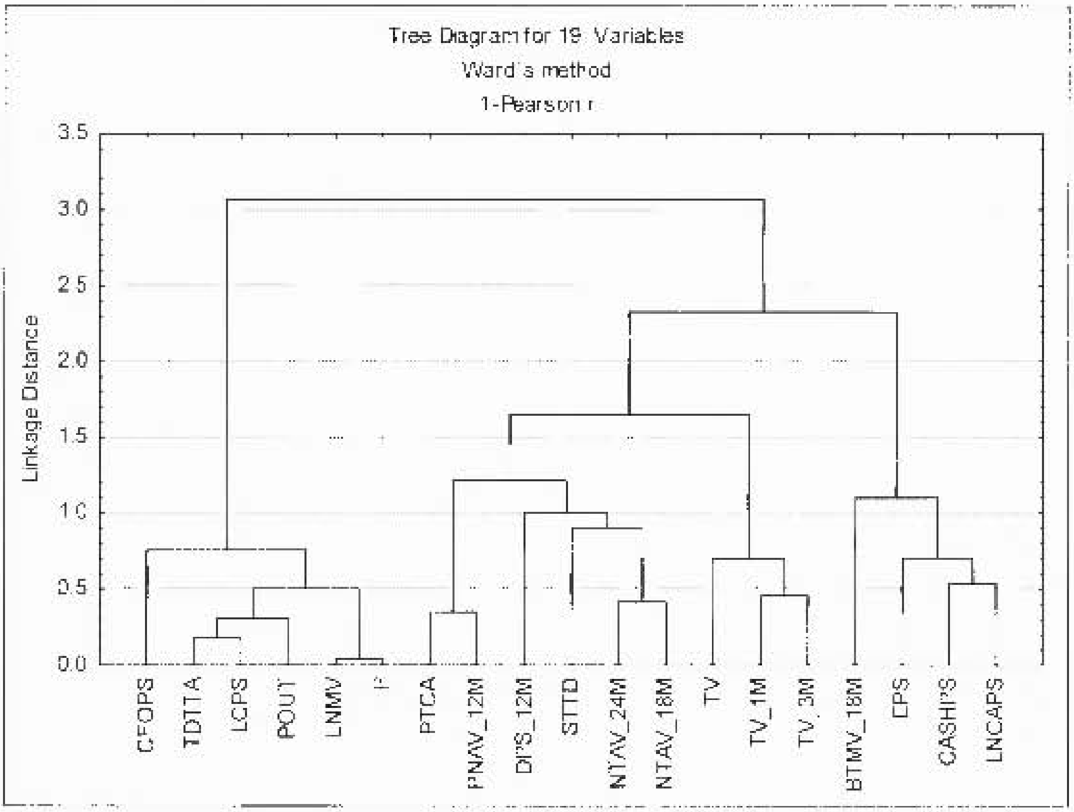
C.4. Tree Diagram of Clusters of Monthly Payoffs: CAPM risk adjusted Returns

The horizontal tree diagram showing the hierarchical cluster analysis of monthly coefficients to standardised firm-specific attributes as calculated from univariate cross sectional regressions on standardised CAPM adjusted total monthly returns data over the period 31 January 2001 to 31 July 2005. Only attributes with an average of monthly coefficients significant at the 5% level in a Student's (1908) t-test are included. The data were extracted from DataStream International, available at the University of Cape Town. Ward's method is used for clustering. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



C.5. Tree Diagram of Clusters of Monthly Payoffs: APT risk adjusted Returns

The horizontal tree diagram showing the hierarchical cluster analysis of monthly coefficients to standardised firm-specific attributes as calculated from univariate cross-sectional regressions on standardised APT adjusted total monthly returns data over the period 31 January 2000 to 31 July 2005. Only attributes with an average of monthly coefficients significant at the 5% level in a Student's (1908) t test are included. The data were extracted from DataStream International, available at the University of Cape Town. Ward's method is used for clustering. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



C.6 Significant Attributes: CAPM risk adjusted Returns

Univariate cross-sectional regressions of standardised firm-specific attributes on CAPM risk adjusted monthly returns data over the period 31 January 1989 to 31 July 2005, are performed and give rise to a time series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The table displays the attributes, the grouping, mean monthly payoff (coefficient), and correlation between attributes and CAPM adjusted returns for each attribute that is significant at the 5% level using Student's (1908) t-test. Attributes are ranked in descending order of their absolute value of the t-statistics. The italicized and highlighted attributes, are for comparison purposes and are discussed in Section 6.1.5. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	T statistic	Mean Payoff	Correlation
P	Size	**-6.19**	-0.014	-0.07
POUT	Growth	**-5.29**	-0.007	-0.05
NTAV_18M	Growth	**5.14**	0.006	0.06
NTAV_24M	Value	**4.48**	0.005	0.05
LNMV	Size	**-4.27**	-0.020	-0.07
TV_3M	Liquidity	**4.13**	0.004	0.04
PNAV_12M	Value	**3.31**	0.007	0.07
BTMV_18M	Value	**3.27**	0.006	0.04
TV_1M	Liquidity	**3.21**	0.003	0.02
LCPS	Size	**-2.85**	-0.017	-0.04
DEBTNTAV	Risk	**-2.76**	-0.003	-0.02
DPS_12M	Growth	**2.55**	0.002	0.03
CASHPS	Size	**-2.50**	-0.014	-0.03
CFOPS	Size	**-2.35**	-0.006	-0.02
PNTAV	Value	**-2.18**	-0.004	-0.02
DPS_18M	Growth	**2.17**	0.002	0.03
BOR_REPAY_24M	Growth	**-2.15**	-0.002	-0.01
PSALES_3M	Value	**2.05**	0.003	0.04
EPS_3M	Growth	**2.00**	0.002	0.02
DY	*Value*	*1.57*	*0.001*	*0.02*
EPS_6m	*Growth*	*1.53*	*0.001*	*0.01*
EPS_12m	*Growth*	*1.40*	*0.001*	*0.01*
BTMV	*Value*	*1.37*	*0.017*	*0.04*
PCASHPS	*Value*	*1.32*	*0.001*	*0.01*
PSALES	*Value*	*1.31*	*0.002*	*0.01*
RI_12M	*Momentum*	*1.21*	*0.003*	*0.05*
PE	*Value*	*-0.41*	*0.000*	*-0.01*
RI_18M	*Momentum*	*0.31*	*0.001*	*0.03*
RI_24M	*Momentum*	*0.23*	*0.001*	*0.02*
RI_6M	*Momentum*	*-0.13*	*-0.001*	*0.03*

C.7 Significant Attributes: APT Risk-adjusted Returns

Univariate cross-sectional regressions of standardised firm-specific attributes on APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attributes, the grouping, mean monthly payoff (coefficient), and correlation between attributes and APT adjusted returns for each attribute that is significant at the 5% level using Student's (1908) t test. Attributes are ranked in descending order of their absolute value of the t-statistics. The italicized and highlighted attributes, are for comparison purposes and are discussed in Section 6.1.5. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

LNCAPS	Size	**-6.89**	-0.010	-0.08
P	Size	**-5.94**	-0.012	-0.06
EPS	Size	**-5.75**	-0.005	-0.05
POUT	Growth	**-4.93**	-0.006	-0.05
TV_3M	Liquidity	**4.24**	0.004	0.04
LNMV	Size	**-3.98**	-0.018	-0.06
NTAV_18M	Growth	**3.59**	0.004	0.04
TV_1M	Liquidity	**3.50**	0.003	0.02
BTMV_18M	Value	**3.19**	0.005	0.03
NTAV_24M	Value	**3.08**	0.004	0.04
STTD	Risk	**3.03**	0.002	0.02
CFOPS	Size	**-2.83**	-0.007	-0.03
LCPS	Size	**-2.75**	-0.017	-0.04
CASHPS	Size	**-2.58**	-0.013	-0.03
PNAV_12M	Value	**2.52**	0.006	0.06
TDTTA	Risk	**-2.50**	-0.003	-0.02
DPS_12M	Growth	**2.16**	0.002	0.02
TV	Liquidity	**2.15**	0.002	0.02
PTCA	Value	**2.01**	0.003	0.03
EPS_3m	*Growth*	*1.67*	*0.001*	*0.02*
PSALES	*Value*	*1.51*	*0.002*	*0.01*
EPS_12m	*Growth*	*1.50*	*0.001*	*0.02*
BTMV	*Value*	*1.32*	*0.015*	*0.03*
DY	*Value*	*0.83*	*0.001*	*0.01*
PE	*Value*	*0.77*	*0.001*	*0.00*
RI_12M	*Momentum*	*0.65*	*0.002*	*0.04*
EPS_6m	*Growth*	*0.62*	*0.001*	*0.01*
PCASHPS	*Value*	*0.55*	*0.000*	*0.01*
RI_6M	*Momentum*	*-0.34*	*-0.001*	*0.02*
RI_24M	*Momentum*	*0.30*	*0.001*	*0.03*
RI_18M	*Momentum*	*0.17*	*0.000*	*0.03*

C.8. Significant Attributes: In sample Unadjusted Returns

Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted returns for monthly returns data over the period January 1989 to 31 December 2000 are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute grouping, mean monthly payoff (coefficient), cumulative payoff, standard deviation and IC ratio for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

PNAV_12M	Value	**6.81**	0.010	0.10
P	Size	**-5.97**	-0.008	-0.06
NTAV_18M	Value	**6.07**	0.008	0.08
LNCAPS	Size	**-5.65**	-0.009	-0.09
POUT	Growth	**-5.37**	-0.006	-0.05
NTAV_24M	Value	**5.15**	0.008	0.08
PNAV_18M	Value	**4.71**	0.008	0.08
PSALES_6M	Value	**4.46**	0.007	0.07
P_12M	Momentum	**4.44**	0.009	0.07
PSALES_3M	Value	**4.27**	0.006	0.06
PNAV_6M	Value	**4.26**	0.006	0.07
VO_3M	Liquidity	**4.14**	0.007	0.05
PNAV_3M	Value	**3.99**	0.006	0.06
TV_3M	Liquidity	**3.91**	0.004	0.04
LNMV	Size	**-3.66**	-0.008	-0.04
STTD	Risk	**3.42**	0.003	0.03
CASHPS	Size	**-3.05**	-0.022	-0.04
RI_18M	Momentum	**2.90**	0.006	0.05
STNCA	Value	**2.81**	0.004	0.04
BTMV_36M	Value	**2.83**	0.005	0.05
TLCTA	Risk	**-2.75**	-0.003	-0.03
P_6M	Momentum	**2.68**	0.005	0.04
CUR_RATIO_12M	Risk	**-2.66**	-0.003	-0.03
MV	Size	**-2.65**	-0.003	-0.02
DEBTNTAV	Risk	**-2.59**	-0.003	-0.03
LCPS	Size	**-2.54**	-0.023	-0.05
PTCA	Value	**2.53**	0.004	0.03
INTCOVER_BT	Risk	**2.51**	0.002	0.03
EBITDA_18M	Growth	**2.49**	0.003	0.03
CF_24M	Growth	**2.40**	0.003	0.04
DY_12M	Value	**-2.33**	-0.003	-0.03
CASHTBORREP	Risk	**2.33**	0.002	0.02
TV	Liquidity	**2.31**	0.003	0.02
EY_12M	Value	**-2.30**	-0.002	-0.02
BTMV_18M	Value	**2.29**	0.004	0.04
EPS_3M	Growth	**2.29**	0.002	0.02
EPS_6M	Growth	**2.15**	0.002	0.02
CF_MARG_24M	Growth	**2.13**	0.002	0.02
BTMV_6M	Value	**2.11**	0.003	0.03
DPS_18M	Growth	**2.08**	0.002	0.03
EY_18M	Value	**-2.04**	-0.002	-0.03
DPS_12M	Growth	**2.02**	0.002	0.03
BTMV	Value	**1.95**	0.003	0.03

C.9.. Significant Attributes: Out sample Unadjusted Returns

Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted returns for monthly returns data over the period January 2000 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute grouping, mean monthly payoff (coefficient), cumulative payoff, standard deviation and IC ratio for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	t-statistic	Mean Payoff	Correlation
P	Size	**-4.55**	-0.012	-0.08
PNTAV	Value	**-3.94**	-0.009	-0.07
CAPS	Size	**-3.47**	-0.006	-0.04
LNCAPS	Size	**-3.30**	-0.010	-0.07
LNMV	Size	**-3.10**	-0.011	-0.07
LCPS	Size	**-2.69**	-0.005	-0.03
TV_1M	Liquidity	**2.67**	0.004	0.03
NTAV_18M	Value	**2.47**	0.004	0.04
EPS	Size	**-2.27**	-0.003	-0.03
CASHPS	Size	**-2.21**	-0.003	-0.03
PNAV_12M	Value	**1.99**	0.005	0.04

C.11. Significant Attributes: In sample CAPM risk adjusted returns

Univariate cross-sectional regressions of standardised firm-specific attributes on CAPM risk adjusted returns for monthly returns data over the period 31 January 1989 to 31 December 2000 are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute grouping, mean monthly payoff (coefficient), cumulative payoff, standard deviation and IC ratio for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	t-statistic	Mean Payoff	Correlation
P	Size	**-6.51**	-0.013	-0.06
POUT	Growth	**-6.37**	-0.007	-0.06
PNAV_12M	Value	**6.33**	0.009	0.09
NTAV_18M	Value	**5.07**	0.006	0.07
LNMV	Size	**-4.97**	-0.019	-0.07
NTAV_24M	Value	**4.52**	0.006	0.07
PSALES_3M	Value	**3.90**	0.005	0.06
TV_3M	Liquidity	**3.87**	0.004	0.04
STTD	Risk	**3.16**	0.003	0.03
CUR_RATIO_12M	Risk	**-3.04**	-0.003	-0.04
PNAV	Value	**2.89**	0.005	0.04
DEBTNTAV	Risk	**-2.79**	-0.003	-0.03
BTMV_18M	Value	**2.63**	0.005	0.04
STNCA	Value	**2.60**	0.004	0.04
DPS_12M	Growth	**2.59**	0.003	0.04
LCPS	Size	**-2.48**	-0.022	-0.05
P_12M	Momentum	**2.42**	0.006	0.06
DPS_18M	Growth	**2.38**	0.002	0.04
PTCA	Value	**2.37**	0.004	0.03
CASHPS	Size	**-2.32**	-0.019	-0.04
CASHTTDRisk		**2.21**	0.003	0.03
CASHTBORREP	Risk	**2.19**	0.002	0.02
BTMV	Value	**2.14**	0.004	0.03
EPS_6M	Growth	**2.08**	0.002	0.02

C.12. Significant Attributes: In sample APT risk adjusted returns

Univariate cross-sectional regressions of standardised firm-specific attributes on APT risk adjusted returns for monthly returns data over the period January 31 1989 to 31 December 2000 are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute, the grouping, mean monthly payoff (coefficient), and correlation for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	t-statistic	Mean Payoff	Correlation
LNCAPS	Size	**-6.59**	-0.009	-0.09
PNAV_12M	Value	**6.70**	0.009	0.09
P	Size	**-6.52**	-0.012	-0.06
POUT	Growth	**-6.02**	-0.006	-0.05
PSALES_3M	Value	**5.02**	0.006	0.06
LNMV	Size	**-4.69**	-0.017	-0.06
NTAV_18M	Value	**4.49**	0.006	0.06
PSALES_6M	Value	**4.29**	0.006	0.06
TV_3M	Liquidity	**4.26**	0.004	0.05
NTAV_24M	Value	**4.11**	0.006	0.06
PNAV	Value	**3.13**	0.004	0.04
STTD	Risk	**3.09**	0.003	0.03
PTCA	Value	**3.03**	0.004	0.04
STNCA	Value	**3.02**	0.003	0.04
EPS_6M	Growth	**2.63**	0.003	0.02
CUR_RATIO_12M	Risk	**-2.60**	-0.003	-0.03
DEBTNTAV	Risk	**-2.58**	-0.003	-0.03
CASHPS	Size	**-2.49**	-0.019	-0.04
BTMV_18M	Value	**2.45**	0.004	0.03
LCPS	Size	**-2.41**	-0.021	-0.05
CASHTBORREP	Risk	**2.37**	0.002	0.02
EPS_3M	Growth	**2.33**	0.002	0.02
P_12M	Momentum	**2.30**	0.006	0.05
TV	Liquidity	**2.20**	0.002	0.02
DPS_12M	Growth	**2.17**	0.002	0.03
BTMV	Value	**2.15**	0.003	0.02
DTL	Risk	**2.15**	0.001	0.02
APC	Value	**2.05**	0.002	0.02

C.13. Significant Attributes: Out sample CAPM Adjusted returns

Univariate cross-sectional regressions of standardised firm-specific attributes on CAPM Adjusted returns for monthly returns data over the period 31 January 2001 to 31 July 2005, are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the S&P TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute, the grouping, mean monthly payoff (coefficient), and correlation for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	t-statistic	Mean Payoff	Correlation
CAPS	Size	**-3.45**	-0.007	-0.04
TV_1M	Liquidity	**3.12**	0.006	0.04
P	Size	**-2.92**	-0.016	-0.07
PNTAV	Value	**-2.27**	-0.012	-0.06
TV_3M	Liquidity	1.92	0.004	0.02
LNMV	Size	-1.83	-0.022	-0.06

C.14. Significant Attributes: Out sample APT Adjusted returns

Univariate cross-sectional regressions of standardised firm-specific attributes on APT Adjusted returns for monthly returns data over the period 31 January 2001 to 31 July 2005, are performed and give rise to a time-series of regression slope coefficients for each characteristic. The share sample consists of the TSX Composite Index constituents at 31 July 2005. It excludes preference shares and has been adjusted for outliers using a winsorisation procedure. The data were extracted from DataStream International, available at the University of Cape Town. The table displays the attribute, the grouping, mean monthly payoff (coefficient), and correlation for each attribute that is significant at the 5% level using Student's (1908) t-test. The attributes are ordered by their grouping descending order of the absolute value of the t-statistics. Other included attributes italicized for comparison purposes are discussed in Section 6.1. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	t-statistic	Mean Payoff	Correlation
CAPS	Size	**-4.38**	-0.008	-0.05
CASHTCA	Value	**3.59**	0.009	0.06
TV_1M	Liquidity	**3.46**	0.007	0.04
P	Size	**-2.57**	-0.013	-0.05
CFOPS	Size	**-2.55**	-0.007	-0.03
APC	Value	**-2.49**	-0.003	-0.03
BTMV_18M	Value	**2.14**	0.008	0.03
VO_3M	Liquidity	**2.14**	0.005	0.03
NS_12M	Size	**2.11**	0.005	0.04
OP_PROFMARG	Growth	**-2.03**	-0.004	-0.02
PE_30M	Value	**2.02**	0.003	0.03
EPS_6M	Growth	**-1.99**	-0.003	-0.02

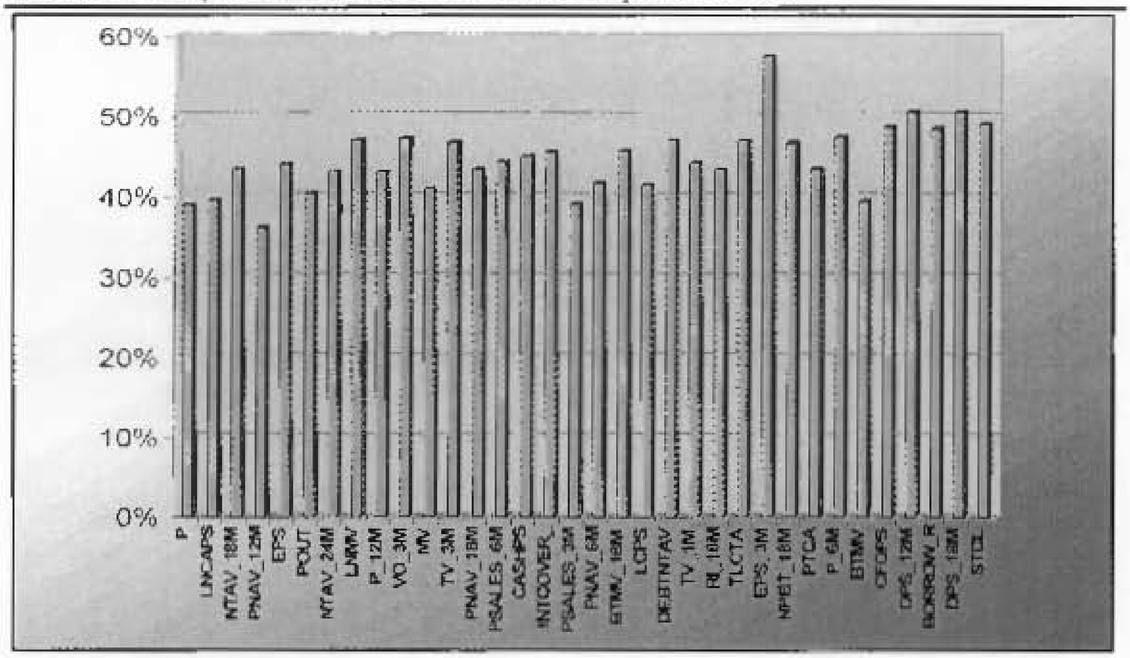
C.15. Binomial sign and Wilcoxon rank signed tests

The tables display the p values of the Sign and Wilcoxon rank sign tests for both unadjusted and risk adjusted samples. The probabilities for the payoffs are at a 5% significance level for both tests. The null hypothesis is that the median is not significantly different from zero. Values below 5% allow for the null hypothesis to be rejected. Highlighted cells represent attributes in which the null hypothesis can be accepted. The monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted and risk adjusted monthly returns data over the period 31 July 1994 to 31 July 2005. The average coefficients(payoffs) to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Unadjusted Results			CAPM adjusted results			APT adjusted results		
Attribute	Binomial P value	Wilcoxon P value	Attribute	Binomial P value	Wilcoxon P value	Attribute	Binomial P value	Wilcoxon P value
P	0.000	0.000	P	0.000	0.000	LNCAPS	0.000	0.000
LNCAPS	0.000	0.000	POUT	0.000	0.000	P	0.000	0.000
NTAV_18M	0.000	0.000	NTAV_18M	0.000	0.000	EPS	0.000	0.000
PNAV_12M	0.000	0.000	NTAV_24M	0.000	0.000	POUT	0.000	0.000
EPS	0.000	0.000	LNMV	0.000	0.000	TV_3M	0.000	0.000
POUT	0.000	0.000	TV_3M	0.000	0.000	LNMV	0.000	0.000
NTAV_24M	0.000	0.000	PNAV_12M	0.000	0.000	NTAV_18M	0.000	0.000
LNMV	0.000	0.000	BTMV_18M	0.002	0.002	TV_1M	0.003	0.001
P_12M	0.000	0.000	TV_1M	0.009	0.003	BTMV_18M	0.021	0.006
VO_3M	0.000	0.000	LCPS	0.000	0.000	NTAV_24M	0.001	0.001
MV	0.000	0.000	DEBTNTAV	0.004	0.002	STTD	0.003	0.002
TV_3M	0.000	0.000	DPS_12M	0.002	0.003	CFOPS	0.000	0.000
PNAV_18M	0.000	0.000	CASHPS	0.000	0.000	LCPS	0.000	0.000
PSALES_6M	0.000	0.000	CFOPS	0.004	0.005	CASHPS	0.000	0.000
CASHPS	0.000	0.000	PNTAV	0.017	0.005	PNAV_12M	0.000	0.000
INTCOVER_BT	0.000	0.001	DPS_18M	0.017	0.016	TDTA	0.001	0.002
PSALES_3M	0.000	0.001	BOR_REPAY_24M	0.026	0.039	DPS_12M	0.001	0.002
PNAV_6M	0.000	0.000	PSALES_3M	0.000	0.001	TV	0.067	0.040
BTMV_18M	0.008	0.006	EPS_3M	0.175	0.075	PTCA	0.010	0.003
LCPS	0.000	0.000						
DEBTNTAV	0.007	0.005						
TV_1M	0.029	0.014						
RI_18M	0.007	0.014						
TLCTA	0.008	0.012						
EPS_3M	0.066	0.027						
NPBT_18M	0.011	0.017						
PTCA	0.026	0.030						
P_6M	0.002	0.005						
BTMV	0.004	0.002						
CFOPS	0.010	0.017						
DPS_12M	0.005	0.012						
BORROW_RATIO	0.018	0.024						
DPS_18M	0.015	0.021						
STCL	0.110	0.066						

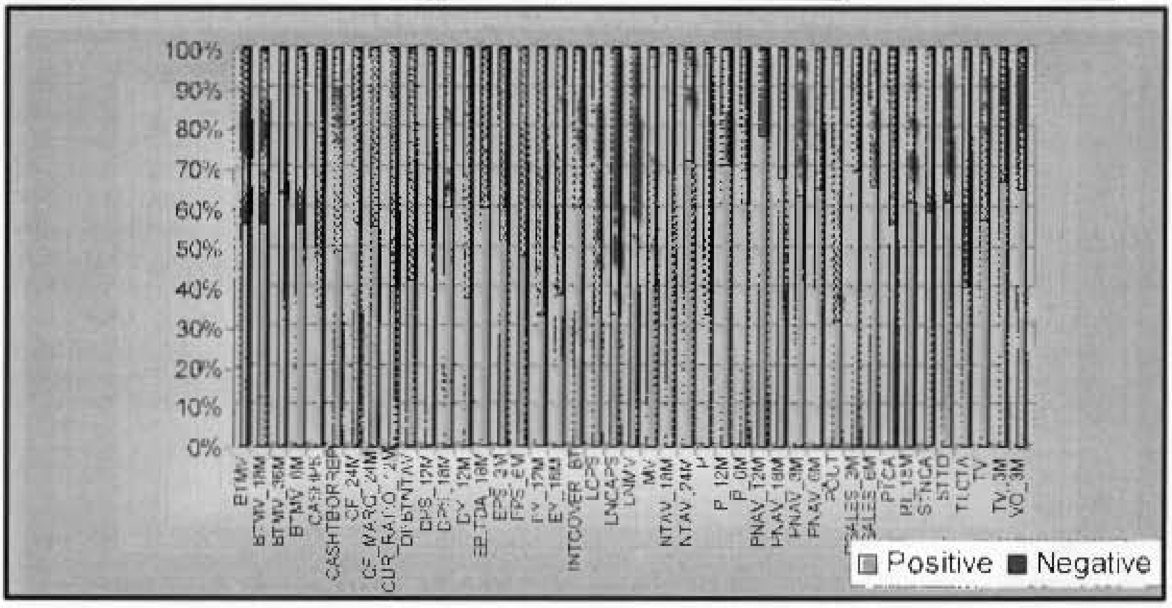
C.16. The Frequency of Changes in Monthly Payoff Direction (Total Sample)

The chart displays the number of times the monthly payoffs change direction expressed as a percentage on the total number of payoffs. The monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average coefficients(payoffs) to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



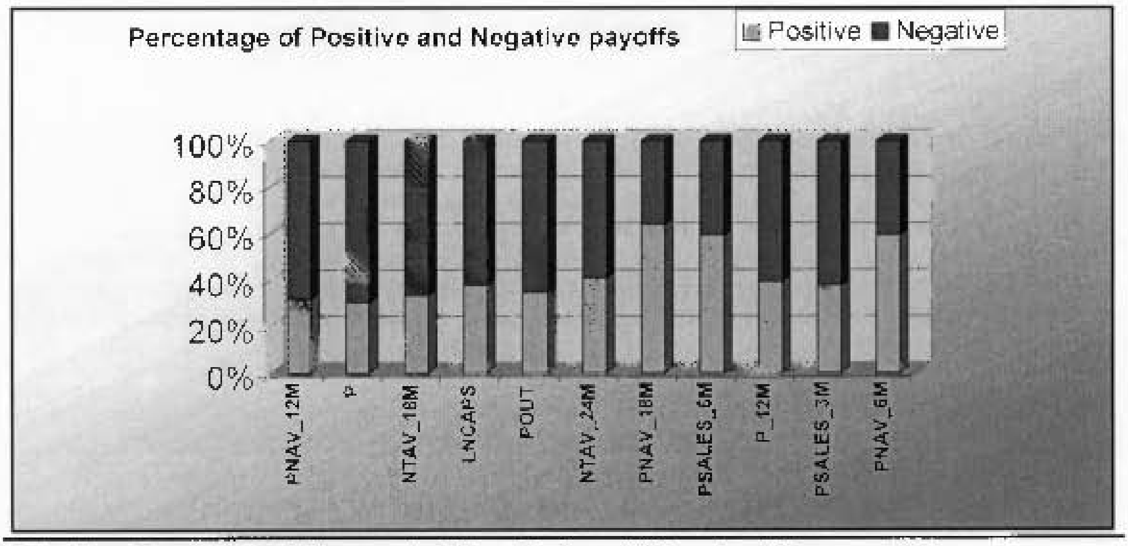
C.17. Consistency of the Direction of Monthly Payoffs (In sample)

The light bars on the chart show the percentage of times the monthly payoffs are positive while the light bars show the percentage of times the payoffs are positive. The monthly payoffs are the monthly coefficients from univariate cross-sectional regressions on standardised unadjusted monthly returns data over the period 31 January 1989 to 31 December 2000. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes



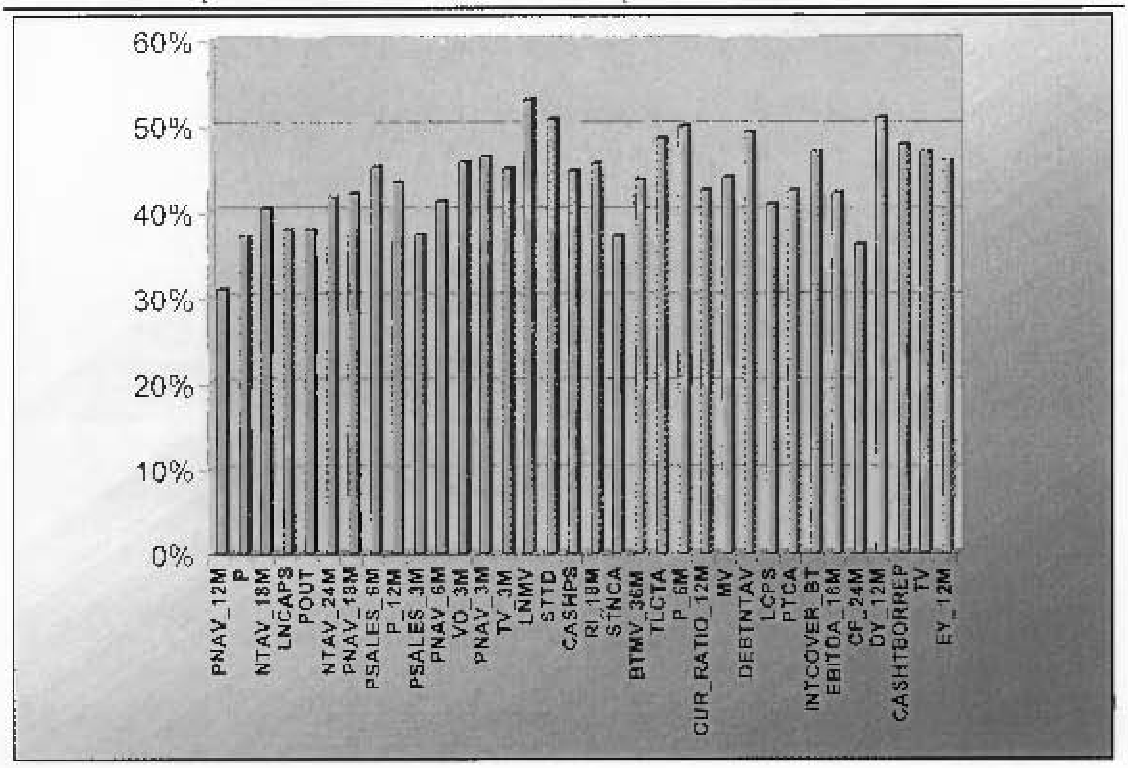
C.18. Consistency of the Direction of Monthly Payoffs (In sample)

The light bars on the chart show the percentage of times the monthly payoffs are positive while the light bars show the percentage of times the payoffs are positive. The monthly payoffs are the monthly coefficients from univariate cross-sectional regressions on standardised unadjusted monthly returns data over the period 31 January 2001 to 31 July 2005. The average payoffs to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.



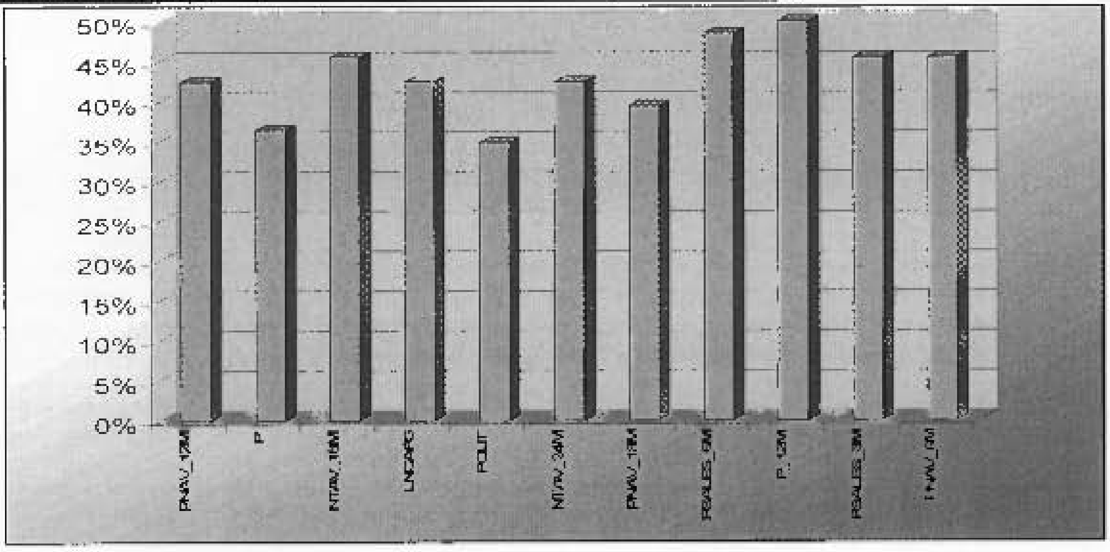
C.19. The Frequency of Changes in Monthly Payoff Direction (Out sample)

The chart displays the number of times the monthly payoffs change direction expressed as a percentage on the total number of payoffs. The monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average coefficients(payoffs) to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.



C.20. The Frequency of Changes in Monthly Payoff Direction (Out sample)

The chart displays the number of times the monthly payoffs change direction expressed as a percentage on the total number of payoffs. The monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The average coefficients(payoffs) to the attributes displayed are significant at the 5% level in a Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes



C.21. Results of Multivariate Cross-Sectional Regressions

Multivariate cross-sectional regressions of the significant standardised univariate attributes on unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed The multivariate regressions start with the most significant univariate attribute, and thereafter attributes are added in the regressions (in order of univariate significance). The time series of independent variables' slopes are subjected to a t tests (using Student's (1908) t-test at the 5% level) and the adjusted r squared of the regression is also taken. Variables are removed if the time series of slopes are not significant or if the attribute does not improve the adjusted r squared value. The procedure produces a multifactor model in which the attributes, as independent variables are univariately and multivariately significant. The results of the regression, as conducted in Econometrics Views is shown below. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Dependent Variable: RAWRETURN
Method: Least Squares
Date: 01/10/07 Time: 18:32
Sample (adjusted): 5305 43752
Included observations: 15218 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.019591	0.000908	21.57044	0
P	-0.007256	0.001228	-5.907372	0
LNCAPS	-0.006828	0.001279	-5.340192	0
PNAV_12M	0.009111	0.00102	8.930331	0
EPS	0.004463	0.001268	3.521281	0.0004
NTAV_24M	0.005869	0.000912	6.433686	0
BTMV	0.0088	0.001277	6.892177	0

R-squared	**0.018636**	Mean dependent var	0.015557
Adjusted R-squared	0.018249	S.D. dependent var	0.102789
S.E. of regression	0.101847	Akaike info criterion	-1.730226
Sum squared resid	157.7815	Schwarz criterion	**-1.726717**
Log likelihood	13172.29	F-statistic	48.14201
Durbin-Watson stat	1.665486	Prob(F-statistic)	0

C.22. Results of Multivariate Cross-Sectional Regressions

Multivariate cross-sectional regressions of the signify
cant standardised univariate attributes on CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed The multivariate regressions start with the most significant univariate attribute, and thereafter attributes are added in the regressions (in order of univariate significance). The time series of independent variables' slopes are subjected to a t tests (using Student's (1908) t-test at the 10% level) and the adjusted r squared of the regression is also taken. Variables are removed if the time series of slopes are not significant or if the attribute does not improve the adjusted r squared value. The procedure produces a multifactor model in which the attributes, as independent variables are univariately and multivariately significant. The results of the regression is shown below. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Dependent Variable: SPALPERR
Method: Least Squares
Date: 01/10/07 Time: 18:16
Sample (adjusted): 5305 43752
Included observations: 18977 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	0.010573	0.000813	**12.99867**	0
P	-0.006315	0.000773	**-8.17093**	0
POUT	-0.002625	0.000775	**-3.387622**	0.0007
NTAV_18M	0.006418	0.000898	**7.145371**	0
TV_1M	0.002798	0.000841	**3.326845**	0.0009
BOR_REPAY_24M	-0.001632	0.000775	**-2.106745**	0.0352

R-squared	**0.008472**	Mean dependent var	0.008373
Adjusted R-squared	**0.00821**	S.D. dependent var	0.108875
S.E. of regression	0.108428	Akaike info criterion	-1.605152
Sum squared resid	223.0334	Schwarz criterion	-1.60267
Log likelihood	15236.49	F-statistic	**32.41802**
Durbin-Watson stat	1.832568	Prob(F-statistic)	0

C.23. Results of Multivariate Cross-Sectional Regressions

Multivariate cross-sectional regressions of the significant standardised univariate attributes on APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005, are performed The multivariate regressions start with the most significant univariate attribute, and thereafter attributes are added in the regressions (in order of univariate significance). The time series of independent variables' slopes are subjected to a t tests (using Student's (1908) t-test at the 10% level) and the adjusted r squared of the regression is also taken. Variables are removed if the time series of slopes are not significant or if the attribute does not improve the adjusted r squared value. The procedure produces a multifactor model in which the attributes, as independent variables are univariately and multivariately significant. The results of the regression, as conducted in Econometrics Views is shown below. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Dependent Variable: SPMALPERR
Method: Least Squares
Date: 01/10/07 Time: 18:29
Sample (adjusted): 2653 43752
Included observations: 13493 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.010528	0.000874	12.04199	0
LNCAPS	-0.003852	0.000814	-4.734566	0
POUT	-0.002092	0.000671	-3.118713	0.0018
TV_1M	-0.003512	0.000948	-3.703674	0.0002
PNAV_12M	0.002475	0.000997	2.48148	0.0131
DPS_12M	0.000946	0.000659	1.996015	0.0171

R-squared	**0.004779**	Mean dependent var	0.006226
Adjusted R-squared	**0.00441**	S.D. dependent var	0.074626
S.E. of regression	0.074461	Akaike info criterion	-2.356644
Sum squared resid	74.77743	Schwarz criterion	-2.353304
Log likelihood	15905.1	F-statistic	**12.95238**
Durbin-Watson stat	1.802923	Prob(F-statistic)	0

Appendix D

D.1. Autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the autocorrelations of the monthly payoffs to attributes are displayed. T-statistics significant at the 5% level are highlighted and shown in bold. Significant t-statistics reject the null hypothesis: The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross sectional regressions on standardised standardised CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
P	1.69	1.79	0.04	0.69	-0.06	0.97	-0.90	1.86	0.50	**2.02**	0.56	0.46
POUT	1.82	0.18	0.77	1.22	1.00	-0.87	-0.90	1.40	-0.07	0.36	-0.36	0.34
NTAV_18M	1.54	1.61	0.70	1.59	0.82	**2.08**	0.84	1.44	**1.99**	-0.01	0.50	-0.86
NTAV_24M	1.55	0.17	-1.02	0.11	-0.43	1.52	0.81	0.50	1.27	1.17	0.53	1.27
LNMV	0.64	1.45	-0.62	1.11	0.06	0.79	-0.70	1.49	-0.15	1.98	-0.39	0.49
TV_3M	0.60	0.21	0.55	0.27	-1.27	-0.69	-0.87	**-2.33**	-0.80	-1.22	-0.14	0.04
PNAV_12M	0.49	-0.15	-0.13	1.56	0.69	-1.18	1.54	**2.31**	0.07	-0.52	-0.11	-0.24
BTMV_18M	0.52	-0.28	0.62	-1.58	**2.23**	-0.29	0.48	**2.69**	-0.70	-0.57	-1.01	-0.24
TV_1M	0.63	0.29	0.74	0.17	-0.62	-0.76	1.14	-1.96	0.35	1.17	1.71	1.21
LCPS	**4.53**	-0.73	-0.93	**2.52**	1.19	-0.55	-0.77	**2.17**	1.29	1.41	0.03	-0.45
DEBTNTAV	0.95	0.70	-0.32	0.42	-0.32	0.45	-0.17	0.50	-1.24	0.62	-0.07	0.70
DPS_12M	0.18	-1.24	0.21	1.00	1.62	-0.73	-0.14	-0.48	-0.69	1.04	-1.22	-0.21
CASHPS	0.63	0.70	1.27	**-2.61**	0.98	1.49	0.43	**4.37**	**2.08**	**3.11**	0.97	-0.83
CFOPS	0.91	-0.21	0.66	**-3.42**	**-2.83**	0.00	-1.00	1.32	**3.69**	-1.05	0.77	0.14
PNTAV	**2.69**	1.24	0.18	0.04	1.04	0.22	0.07	0.42	0.52	0.79	0.74	0.45
DPS_18M	0.13	0.85	0.80	0.45	**1.99**	-1.02	0.14	-0.83	-1.71	0.43	-1.26	1.04
BOR_REPAY_24M	1.76	0.69	0.14	1.77	1.17	-0.04	0.73	-0.70	-1.27	-0.01	0.04	-0.70
PSALES_3M	-0.83	-0.07	0.28	0.24	-0.48	-0.09	0.53	**2.01**	0.36	1.79	-0.70	-0.13
EPS_3M	-0.98	0.42	0.49	-0.70	-1.64	0.10	1.32	0.77	-0.73	-1.48	0.01	0.28

D.2. Autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the autocorrelations of the monthly payoffs to attributes are displayed. T-statistics significant at the 5% level are highlighted and shown in bold. Significant t-statistics reject the null hypothesis: The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross-sectional regressions on standardised standardised APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
LNCAPS	0.43	0.16	0.53	0.03	-0.39	-1.44	0.94	0.27	-0.11	-0.38	0.49	0.94
P	1.00	1.54	0.13	0.95	0.77	0.45	-0.80	1.64	-0.06	1.46	-0.22	-1.21
EPS	0.91	1.52	0.73	**2.01**	-0.29	-0.06	-0.03	-0.81	0.84	-0.41	-0.26	0.71
POUT	1.56	0.00	0.43	0.57	0.49	-0.53	-0.36	0.88	-0.10	0.42	-0.31	0.42
TV_3M	0.13	0.25	0.48	0.87	-0.43	0.36	-0.39	**-2.30**	-1.04	-1.04	0.20	-1.22
LNMV	0.43	1.15	-0.43	0.94	0.24	0.52	-0.69	1.52	-0.22	1.35	-0.49	-0.45
NTAV_18M	0.14	**2.23**	-0.17	1.94	1.38	1.41	-0.38	0.73	1.94	-0.39	0.60	**-2.34**
TV_1M	1.58	-0.14	0.67	0.70	-0.13	0.24	0.63	**-3.07**	0.01	1.24	1.12	1.62
BTMV_18M	**2.11**	0.70	1.48	-0.64	-1.42	-0.29	-0.41	0.45	1.45	1.62	0.39	1.64
NTAV_24M	0.36	1.95	**-1.99**	1.91	0.15	**3.65**	0.35	0.69	0.27	**2.23**	0.69	-0.94
STTD	0.56	-1.64	0.59	1.31	0.73	-1.05	-0.53	0.45	1.92	1.35	1.14	-0.36
CFOPS	-0.96	-0.70	0.84	**-4.52**	**-2.36**	0.11	0.76	1.51	**3.91**	-1.00	1.00	-0.13
LCPS	**5.28**	-0.46	-1.41	0.91	1.61	0.57	-0.90	1.86	0.91	1.24	-0.11	-0.07
CASHPS	1.24	0.70	1.18	**-2.31**	**2.53**	1.78	0.59	**4.12**	1.07	**4.29**	1.31	0.06
PNAV_12M	-1.48	1.62	0.10	0.06	-0.46	-0.52	0.22	**2.49**	**2.34**	**-2.10**	-0.57	1.18
TDTTA	0.52	0.04	0.69	0.41	-0.10	-0.64	-0.25	0.39	1.04	-0.26	-0.62	1.71
DPS_12M	0.31	-1.56	0.49	0.67	0.93	-0.21	0.91	-1.32	-0.41	0.43	-1.36	0.42
TV	0.17	0.93	1.26	1.56	-0.24	0.98	1.46	0.52	0.56	0.20	0.03	-0.01
PTCA	0.88	1.14	0.24	-1.02	-1.66	-0.24	0.41	-0.77	1.24	1.31	0.20	0.25

D.3. Partial-autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the partial autocorrelations of the monthly payoffs to attributes are displayed. T-statistics significant at the 5% level are highlighted and shown in bold. Significant t-statistics reject the null hypothesis. The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross sectional regressions on standardised standardised CAPM adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
P	1.59	1.64	-0.32	0.52	-0.14	0.87	-0.77	1.84	0.31	1.51	0.21	-0.17
POUT	1.62	-0.06	0.77	1.04	0.73	1.15	-0.38	1.48	-0.49	0.60	0.46	0.25
NTAV_18M	1.54	1.45	-0.13	1.46	0.55	1.69	0.39	0.07	1.08	-0.93	0.06	-1.34
NTAV_24M	1.55	-0.01	-1.65	0.48	-0.48	1.46	0.57	0.21	1.59	0.95	0.56	1.42
LNMV	0.64	1.42	-0.74	1.04	0.08	0.55	-0.09	1.39	-0.13	1.29	-0.32	0.06
TV_3M	0.60	0.18	0.52	0.22	-1.29	-0.52	-0.91	**-2.18**	-0.56	-1.22	0.00	0.01
PNAV_12M	0.49	0.17	0.11	1.66	0.57	-1.71	1.71	**2.07**	-0.28	-0.72	-0.72	-1.02
BTMV_18M	0.52	0.31	0.64	1.64	**2.43**	-0.67	0.86	**2.12**	-0.39	-0.94	-0.95	0.21
TV_1M	0.93	0.27	0.73	0.10	-0.50	-0.74	1.24	**-2.01**	0.62	1.08	1.76	1.08
LCPS	**4.53**	**-2.30**	0.03	**3.11**	-0.95	-0.32	0.10	**2.14**	-0.57	1.91	-0.45	-1.11
DEBTNTAV	0.95	0.63	-0.42	0.43	-0.35	0.45	-0.17	0.46	-1.27	0.71	0.00	0.55
DPS_12M	0.18	-1.24	0.24	0.88	1.65	-0.62	0.11	-0.74	-0.79	0.87	-1.21	0.08
CASHPS	0.53	0.67	1.21	**-2.77**	1.18	1.61	0.66	**3.58**	**1.99**	**3.57**	0.31	-0.03
CFOPS	0.91	0.27	0.69	**-3.56**	**-2.44**	0.14	-0.80	1.00	**2.53**	-1.82	0.59	-0.13
PNTAV	**2.59**	0.90	-0.19	-0.03	1.06	-0.14	-0.11	0.45	0.41	0.52	0.48	0.18
DPS_18M	0.13	-0.99	0.81	0.38	**2.10**	-1.10	0.41	-1.29	-1.06	0.07	-1.15	1.35
BOR_REPAY_24M	1.75	0.45	0.00	1.19	-1.49	0.20	0.84	-1.05	-0.90	0.22	-0.00	-0.43
PSALES_3M	0.83	0.11	0.27	0.27	-0.45	-0.75	0.43	**2.10**	0.67	1.91	-0.63	-0.31
EPS_3M	-0.98	0.35	0.55	-0.84	-1.76	-0.32	-1.22	0.70	-0.73	-1.64	-0.40	0.15

D.4. Partial-autocorrelation t-statistics of Monthly Payoffs to Attributes for Lags One to Twelve

The t-statistics of the partial autocorrelations of the monthly payoffs to attributes are displayed. T-statistics significant at the 5% level are highlighted and shown in bold. Significant t statistics reject the null hypothesis: The correlation coefficient is not different from zero at lag k. Monthly payoffs are derived from univariate cross-sectional regressions on standardised standardised APT adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town.. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
LNCAPS	-0.43	-0.20	-0.55	-0.01	-0.41	-1.48	0.64	0.25	-0.16	-0.34	0.41	0.87
P	1.00	1.45	0.07	0.80	0.67	0.18-0	80	1.66	-0.24	1.10	-0.31	-1.62
EPS	0.91	-1.58	0.97	1.74	-0.41	0.35-0	34	-1.01	1.07	-0.80	0.16	0.61
POUT	1.58	-0.17	0.46	0.48	0.38	-1.05	-0.17	0.90	-0.25	0.55	-0.39	-0.45
TV_3M	0.13	0.25	0.46	0.87	-0.48	0.32-0	45	**-2.34**	1.00	-1.07	0.46	-0.90
LNMV	0.43	1.14	-0.50	0.88	0.25	0.35-0	70	1.42	-0.22	1.07	-0.41	-0.80
NTAV_18M	-0.14	**2.23**	-0.15	1.52	1.51	1.00-0	74	0.24	1.92	-0.95	-1.36	**-2.30**
TV_1M	1.58	-0.32	0.73	0.55	-0.24	0.25	0.50	**-3.28**	0.81	1.02	1.12	1.61
BTMV_18M	**2.11**	0.39	1.35	-1.11	-1.31	0.00-0	10	0.53	1.27	1.17	-1.14	1.54
NTAV_24M	0.35	1.95	**-2.14**	1.85	0.57	**2.93**	0.55	-0.75	1.05	1.65	-1.29	**-2.17**
STTD	0.55	-1.56	0.73	1.07	0.86	-0.91	-0.46	0.10	1.79	-1.35	1.94	-1.18
CFOPS	-0.60	-0.76	0.74	**-4.48**	**-3.08**	-0.95	0.90	0.15	**2.65**	-1.01	0.73	0.06
LCPS	**5.28**	**-2.56**	0.38	1.84	0.41	-0.17	-0.71	**3.22**	-1.59	1.75	-0.70	0.24
CASHPS	1.24	0.60	1.06	**-2.58**	**3.04**	1.39	0.48	**3.20**	1.19	**4.58**	-0.14	1.06
PNAV_12M	-1.48	-1.61	-0.29	-0.14	-0.50	-0.66	-0.03	**2.43**	**3.17**	-0.86	-0.42	-1.84
TDTTA	-0.52	0.01	0.59	0.35	-0.07	-0.69	-0.27	0.36	1.01	-0.17	-0.00	1.74
DPS_12M	0.31	-1.59	0.57	0.40	0.94	-0.15	1.10	-1.55	-0.15	0.01	-1.44	0.59
TV	0.17	0.93	1.24	1.51	-0.42	0.70	1.25	0.76	0.35	0.14	-0.17	0.07
PTCA	0.88	-1.19	0.39	-1.24	-1.48	-0.86	0.29	-1.02	1.24	0.70	0.21	-0.27

D.5 Ljung-Box Q-Statistic p-values Monthly Payoffs to Attributes for Lags One to Twelve

The Ljung-Box (1978) Q-statistics p-values of lags one to twelve of monthly payoffs to standardised attributes are displayed. The monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the 31 January 1989 to 31 July 2005 period. The data were extracted from DataStream International, available at the University of Cape Town. The Q statistics test for the null hypothesis that there is no autocorrelation up to order k. If the null hypothesis is accepted, Q follows a chi-squared distribution with k degrees of freedom. P values for attributes significant at the 5% level are displayed in bold and highlighted. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
P	**0.01**	**0.02**	**0.04**	0.07	0.07	0.11	0.16	0.08	0.10	0.11	**0.05**	**0.04**
LNCAPS	0.09	**0.05**	0.11	0.15	0.17	0.09	0.14	0.21	0.28	0.29	0.06	0.07
NTAV_18M	0.15	**0.02**	**0.04**	**0.02**	**0.03**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**0.02**
PNAV_12M	0.09	**0.05**	**0.05**	0.05	0.10	0.13	0.08	0.09	0.12	0.16	0.21	0.24
EPS	0.16	0.25	0.30	0.43	0.17	0.25	0.32	0.42	0.49	0.50	0.48	0.56
POUT	**0.01**	**0.03**	0.06	0.11	0.18	0.27	0.37	0.46	0.56	0.65	0.73	0.53
NTAV_24M	0.08	0.17	0.23	0.35	0.47	0.24	0.22	0.23	0.15	0.14	0.17	0.20
LNMV	**0.04**	**0.03**	0.07	**0.03**	**0.05**	0.08	0.11	**0.05**	0.07	0.08	0.12	0.08
P_12M	0.15	0.38	0.13	0.17	0.24	0.32	0.32	0.28	0.33	0.37	0.35	0.43
VO_3M	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.01**	**0.01**	**0.02**	**0.01**
MV	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**
TV_3M	0.20	0.27	0.29	0.40	0.35	0.46	0.56	0.40	0.45	0.39	0.48	0.45
PNAV_18M	**0.00**	**0.01**	**0.02**	**0.02**	**0.04**	0.06	0.09	0.10	0.13	0.18	0.24	0.31
PSALES_6M	0.67	0.84	0.85	0.80	0.74	0.64	0.69	0.36	0.45	0.19	0.23	0.27
CASHPS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
INTCOVER_BT	0.25	0.29	0.47	0.59	0.69	0.65	0.71	0.76	0.86	0.84	0.87	0.85
PSALES_3M	0.74	0.92	0.98	0.48	0.24	0.34	0.45	0.53	0.61	0.41	0.47	0.51
PNAV_6M	0.85	0.90	0.68	0.83	0.83	0.90	0.93	0.74	0.78	0.75	0.71	0.78
BTMV_18M	0.54	0.43	0.26	0.34	0.16	0.25	0.34	0.44	0.48	0.58	0.56	0.64
LCPS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
DEBTNTAV	0.55	0.77	0.89	0.91	0.93	0.89	0.76	0.71	0.79	0.86	0.87	0.87
TV_1M	0.35	0.45	0.56	0.78	0.70	0.44	0.53	0.13	0.19	0.25	0.30	0.21
RI_18M	**0.02**	**0.01**	**0.04**	0.07	**0.04**	0.06	0.07	0.07	0.11	0.14	0.19	0.25
TLCTA	0.68	0.15	0.25	0.38	0.46	0.51	0.53	0.64	0.67	0.72	0.77	0.83
EPS_3M	0.44	0.45	0.06	0.72	0.53	0.59	0.49	0.57	0.66	0.43	0.61	0.48
NPBT_18M	0.98	0.82	0.19	0.16	0.16	0.24	0.20	0.27	0.36	0.39	0.35	0.47
PTCA	**0.01**	**0.02**	0.05	0.10	0.07	0.11	0.15	0.22	0.30	0.28	0.35	0.32
P_6M	0.49	0.16	0.23	0.30	0.24	0.34	0.45	0.21	0.29	0.31	0.27	0.34
BTMV	0.44	0.70	0.87	0.93	0.90	0.92	0.96	0.97	0.98	0.99	0.99	1.00
CFOPS	0.13	0.30	0.44	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
DPS_12M	0.69	0.21	0.34	0.35	0.79	0.40	0.51	0.60	0.69	0.72	0.57	0.64
BORROW_RATIO	0.60	0.20	0.07	0.13	0.20	0.15	0.18	0.17	0.24	0.13	0.12	0.16
DPS_18M	0.87	0.52	0.69	0.77	0.34	0.42	0.53	0.60	0.49	0.59	0.63	0.70
STCL	0.20	0.18	0.22	0.20	0.19	0.27	0.05	0.12	0.17	0.24	**0.04**	0.06

D.6. Ljung-Box Q-Statistic p-values Monthly Payoffs to Attributes for Lags One to Twelve

The Ljung-Box (1978) Q-statistics p-values of lags one to twelve of monthly payoffs to standardised attributes are displayed. The monthly payoffs are derived from univariate cross sectional regressions on standardised CAPM risk adjusted total monthly returns data over the 31 January 1989 to 31 July 2005 period. The data were extracted from DataStream International, available at the University of Cape Town. The Q-statistics test for the null hypothesis that there is no autocorrelation up to order k. If the null hypothesis is accepted, Q follows a chi-squared distribution with k degrees of freedom. P values for Attributes significant at the 5% level are displayed in bold and highlighted. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
P	0.11	0.35	0.12	0.18	0.27	0.29	0.36	0.18	0.23	0.10	0.13	0.17
POUT	0.07	0.19	0.26	0.24	0.26	0.29	0.37	0.27	0.38	0.43	0.51	0.59
NTAV_18M	0.14	0.10	0.21	0.14	0.18	0.07	0.09	0.07	**0.03**	0.05	0.07	0.05
NTAV_24M	0.14	0.34	0.21	0.34	0.45	0.34	0.38	0.46	0.42	0.40	0.45	0.41
LNMV	0.62	0.25	0.40	0.38	0.52	0.56	0.51	0.46	0.58	0.38	0.45	0.51
TV_3M	0.65	0.62	0.87	0.54	0.75	0.84	0.63	0.34	0.37	0.33	0.41	0.50
PNAV_12M	0.63	0.58	0.97	0.57	0.64	0.58	0.42	0.14	0.20	0.25	0.32	0.39
BTMV_18M	0.62	0.55	0.88	0.55	0.18	0.26	0.34	0.08	0.10	0.13	0.14	0.19
TV_1M	0.52	0.78	0.79	0.93	0.91	0.91	0.54	0.49	0.57	0.53	0.35	0.32
LCPS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
DEBTNTAV0	34	0.49	0.68	0.79	0.87	0.92	0.96	0.97	0.91	0.93	0.96	0.96
DPS_12M	0.86	0.47	0.57	0.64	0.41	0.47	0.58	0.56	0.72	0.70	0.84	0.72
CASHPS	0.62	0.83	0.46	0.05	0.07	**0.05**	0.07	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
CFOPS	0.37	0.65	0.73	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
PNTAV	**0.01**	**0.02**	**0.04**	0.08	0.10	0.15	0.22	0.29	0.28	0.39	0.43	0.50
DPS_18M	0.53	0.59	0.72	0.82	0.35	0.40	0.51	0.54	0.37	0.45	0.40	0.40
BOR_REPAY_24M	0.10	0.20	0.36	0.34	0.33	0.45	0.51	0.56	0.51	0.61	0.69	0.73
PSALES_3M	0.41	0.71	0.86	0.93	0.96	0.96	0.97	0.65	0.73	0.49	0.53	0.62
EPS_3M	0.32	0.56	0.70	0.75	0.46	0.59	0.45	0.53	0.57	0.45	0.54	0.62

D.7. Ljung-Box Q-Statistic p-values Monthly Payoffs to Attributes for Lags One to Twelve

The Ljung-Box (1978) Q-statistics p-values of lags one to twelve of monthly payoffs to standardised attributes are displayed. The monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the 31 January 1989 to 31 July 2005 period. The data were extracted from DataStream International, available at the University of Cape Town. The Q statistics test for the null hypothesis that there is no autocorrelation up to order k. If the null hypothesis is accepted, Q follows a chi squared distribution with k degrees of freedom. P-values for Attributes significant at the 5% level are displayed in bold and highlighted. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

Attribute	LAGS											
	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
LNCAPS	0.66	0.99	0.92	0.97	0.98	0.83	0.81	0.87	0.92	0.95	0.96	0.95
P	0.31	0.18	0.33	0.35	0.42	0.52	0.59	0.33	0.43	0.32	0.40	0.36
EPS	0.35	0.20	0.29	0.10	0.16	0.24	0.34	0.37	0.40	0.48	0.56	0.60
POUT	0.11	0.29	0.44	0.55	0.65	0.65	0.74	0.74	0.82	0.87	0.91	0.93
TV_3M	0.90	0.96	0.96	0.90	0.94	0.97	0.98	0.54	0.52	0.51	0.59	0.54
LNMV	0.66	0.46	0.63	0.62	0.74	0.81	0.84	0.66	0.74	0.64	0.70	0.75
NTAV_18M	0.89	0.10	0.20	0.10	0.09	0.08	0.12	0.15	0.07	0.10	0.13	**0.04**
TV_1M	0.12	0.29	0.40	0.48	0.53	0.74	0.78	0.10	0.14	0.13	0.13	0.08
BTMV_18M	**0.04**	0.10	0.09	0.14	0.11	0.17	0.24	0.31	0.25	0.18	0.23	0.16
NTAV_24M	0.73	0.17	0.07	**0.04**	0.07	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**
STTD	0.57	0.22	0.34	0.27	0.33	0.33	0.39	0.48	0.25	0.21	0.20	0.25
CFOPS	0.40	0.55	0.60	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
LCPS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
CASHPS	0.21	0.36	0.32	0.05	**0.01**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
PNAV_12M	0.15	0.10	0.20	0.33	0.44	0.53	0.64	0.19	0.05	**0.02**	**0.03**	**0.03**
TDTTA	0.60	0.87	0.85	0.92	0.97	0.97	0.98	0.93	0.97	0.99	0.99	0.90
DPS_12M	0.76	0.29	0.44	0.53	0.57	0.69	0.70	0.60	0.68	0.75	0.65	0.71
TV	0.87	0.64	0.47	0.28	0.40	0.41	0.30	0.37	0.44	0.53	0.62	0.70
PTCA	0.37	0.35	0.53	0.50	0.28	0.32	0.41	0.45	0.40	0.34	0.42	0.50

D.8. T-statistics from the simple Dickey-Fuller(unit root) tests

Displays the t-statistics from the simple Dickey Fuller test on the total payoffs of the unadjusted, CAPM risk adjusted and APT risk adjusted. The maximum number of lags is set to twelve. A series is found to be non-stationary if the t-statistic for each β coefficients lies to the left of the Mackinnone critical value at the 5% level. The monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the 31 January 1989 to 31 July 2005 period. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. All attributes are found to be significant. At the 5% level.

Attribute	Dickey-Fuller T statistic	Attribute	Dickey-Fuller T statistic	Attribute	Dickey-Fuller T statistic
P	-6.07	P	-5.55	LNCAPS	-6.62
LNCAPS	-6.49	POUT	-4.98	P	-5.21
NTAV_18M	-4.60	NTAV_18M	-4.76	EPS	-5.54
PNAV_12M	-5.52	NTAV_24M	-6.01	POUT	-5.49
EPS	-6.74	LNMV	-5.59	TV_3M	-5.77
POUT	-5.65	TV_3M	-6.26	LNMV	-5.59
NTAV_24M	-5.73	PNAV_12M	-5.18	NTAV_18M	-4.37
LNMV	-5.33	BTMV_18M	-5.15	TV_1M	-5.82
P_12M	-6.89	TV_1M	-6.11	BTMV_18M	-6.10
VO_3M	-6.58	LCPS	-5.47	NTAV_24M	-5.00
MV	-5.32	DEBTNTAV	-6.00	STTD	-5.57
TV_3M	-6.61	DPS_12M	-5.14	CFOPS	-9.35
PNAV_18M	-5.56	CASHPS	-7.20	LCPS	-5.37
PSALES_6M	-6.21	CFOPS	-8.30	CASHPS	-6.52
CASHPS	-5.14	PNTAV	-5.34	PNAV_12M	-6.64
INTCOVER_BT	-6.44	DPS_18M	-5.01	TDTTA	-6.22
PSALES_3M	-7.56	BOR_REPAY_24M	-5.64	DPS_12M	-5.54
PNAV_6M	-6.01	PSALES_3M	-6.21	TV	-5.05
BTMV_18M	-4.90	EPS_3M	-7.01	PTCA	-7.32
LCPS	-4.99				
DEBTNTAV	-6.35				
TV_1M	-6.55				
RI_18M	-6.73				
TLCTA	-6.53				
EPS_3M	-6.84				
NPBT_18M	-5.22				
PTCA	-6.67				
P_6M	-7.52				
BTMV	-5.60				
CFOPS	-8.66				
DPS_12M	-5.57				
BORROW_RATIO	-5.91				
DPS_18M	-5.31				
STCL	-4.90				

D.9. Correlation t-statistics of Forecasts and Realised Payoffs

The correlations t-statistics between the forecast and realised payoffs are calculated for each standardised style characteristic for each model. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. Correlations significant at the 5% level are displayed in bold. The greater the correlation the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	1.61	**6.93**	**5.59**	**3.59**	1.87	-0.09
POUT	Size	1.81	**7.53**	**4.76**	**3.47**	**2.03**	**4.31**
NTAV_18M	Value	1.77	**7.25**	**5.64**	**4.06**	**3.48**	**-6.05**
NTAV_24M	Value	1.83	**5.62**	**5.16**	**3.63**	**2.47**	**-3.59**
LNMV	Size	0.64	**6.72**	**4.89**	**3.45**	1.63	**11.77**
TV_3M	Growth	0.56	**5.88**	**2.54**	**3.29**	**2.48**	**11.46**
PNAV_12M	Value	0.47	**6.75**	**4.56**	**3.74**	1.62	**-4.02**
BTMV_18M	Size	0.43	**6.26**	**3.62**	**3.06**	**2.00**	-0.08
TV_1M	Momentum	0.63	**6.27**	**4.59**	**3.83**	**3.39**	**14.63**
LCPS	Liquidity	**4.85**	**7.85**	**5.26**	**3.48**	**5.84**	-0.98
DEBTNTAV	Size	0.97	**6.38**	**4.07**	**2.58**	**2.74**	0.83
DPS_12M	Liquidity	0.19	**6.86**	**3.84**	**2.95**	**3.23**	-0.32
CASHPS	Value	1.31	**6.22**	**6.19**	**2.82**	**8.96**	**-2.60**
CFOPS	Value	0.81	**3.71**	**3.55**	**2.75**	**3.55**	**-5.35**
PNTAV	Size	**2.58**	**7.12**	**5.04**	**4.13**	**2.59**	**13.37**
DPS_18M	Risk	0.22	**6.90**	**3.59**	**3.20**	**2.37**	-0.84
BOR_REPAY_24M	Value	1.18	**6.22**	**3.74**	**3.57**	**2.47**	0.25
PSALES_3M	Value	-0.83	**5.95**	**4.82**	**3.18**	**1.99**	0.21
EPS_3M	Value	-0.98	**5.25**	**2.98**	**3.80**	**2.10**	**10.12**
Mean		1.05	**6.40**	**4.44**	**3.40**	**2.99**	**2.26**

D.10. Correlation t-statistics of Forecasts and Realised Payoffs

The correlations t-statistics between the forecast and realised payoffs are calculated for each standardised style characteristic for each model. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. Correlations significant at the 5% level are displayed in bold. The greater the correlation the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
LNCAPS	Size	-0.42	**5.77**	**3.72**	**3.48**	**2.14**	**3.72**
P	Size	1.01	**7.25**	**5.10**	**3.02**	1.97	**5.10**
EPS	Value	0.88	**6.87**	**4.35**	**3.26**	**2.58**	**4.35**
POUT	Value	1.57	**6.89**	**4.37**	**2.83**	**2.21**	**4.37**
TV_3M	Size	0.12	**6.43**	**3.19**	**2.29**	**2.52**	**3.19**
LNMV	Growth	0.43	**6.72**	**4.70**	**3.10**	1.65	**4.70**
NTAV_18M	Value	-0.20	**7.29**	**4.74**	**3.45**	**2.72**	**4.74**
TV_1M	Size	1.57	**6.56**	**4.34**	**3.36**	**3.54**	**4.34**
BTMV_18M	Momentum	**2.06**	**5.79**	**4.28**	**3.58**	**2.13**	**4.28**
NTAV_24M	Liquidity	0.08	**6.60**	**4.73**	**2.99**	**2.23**	**4.73**
STTD	Size	0.58	**6.62**	**4.09**	**3.42**	**2.89**	**4.09**
CFOPS	Liquidity	-0.81	**3.33**	**4.40**	**3.38**	**3.81**	**4.40**
LCPS	Value	**5.54**	**7.45**	**5.15**	**3.43**	**5.71**	**5.15**
CASHPS	Value	1.58	**7.40**	**6.54**	**3.41**	**9.01**	**6.54**
PNAV_12M	Size	-1.63	**5.24**	**4.08**	**3.38**	1.42	**4.08**
TDTTA	Risk	-0.52	**6.05**	**4.04**	**3.57**	**2.25**	**4.04**
DPS_12M	Value	0.32	**6.35**	**3.70**	**2.94**	**3.31**	**3.70**
TV	Value	0.21	**7.30**	**5.32**	**3.97**	**2.06**	**5.32**
PTCA	Value	0.89	**5.00**	**4.15**	**3.24**	**2.20**	**4.15**
Mean		0.70	**6.36**	4.47	3.27	2.97	4.47

D.11. Direction Ratios Comparing Forecast to Realised Payoffs

Direction ratios display the number of times the payoff directions to each attribute is correctly forecast as a percentage of total forecasts. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The greater the direction ratio the better the style-timing model. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	0.65	**0.76**	**0.76**	**0.76**	**0.74**	**0.75**
POUT	Size	0.57	**0.73**	**0.72**	**0.68**	**0.70**	**0.70**
NTAV_18M	Value	0.53	0.64	0.60	0.55	0.59	0.58
NTAV_24M	Value	0.53	0.62	0.60	0.62	0.61	0.57
LNMV	Size	0.60	**0.72**	**0.68**	**0.66**	**0.67**	**0.67**
TV_3M	Growth	0.56	0.62	0.62	0.63	0.62	0.61
PNAV_12M	Value	0.59	**0.72**	**0.68**	**0.66**	0.64	0.62
BTMV_18M	Size	0.57	**0.68**	0.64	0.61	0.59	0.59
TV_1M	Momentum	0.55	**0.69**	**0.67**	0.64	0.63	**0.79**
LCPS	Liquidity	0.58	**0.70**	**0.66**	0.65	**0.65**	0.63
DEBTNTAV	Size	0.56	0.63	0.63	0.59	0.59	0.57
DPS_12M	Liquidity	0.52	0.64	**0.66**	0.57	0.57	0.55
CASHPS	Value	0.57	**0.68**	**0.70**	**0.68**	**0.69**	**0.69**
CFOPS	Value	0.56	**0.70**	**0.67**	**0.66**	0.65	0.60
PNTAV	Size	0.57	**0.68**	**0.66**	0.57	0.60	0.63
DPS_18M	Risk	0.50	**0.71**	0.57	0.60	0.56	0.52
BOR_REPAY_24M	Value	0.53	0.63	0.63	0.58	0.61	0.38
PSALES_3M	Value	0.49	**0.66**	**0.66**	0.62	0.63	0.63
EPS_3M	Value	0.43	0.63	0.54	0.58	0.52	0.55
Mean		0.55	0.68	0.65	0.63	0.62	0.61
Standard deviation		0.05	0.04	0.05	0.05	0.05	0.09

D.12. Direction Ratios Comparing Forecast to Realised Payoffs

Direction ratios display the number of times the payoff directions to each attribute is correctly forecast as a percentage of total forecasts. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The greater the direction ratio the better the style-timing model. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
LNCAPS	Size	0.60	**0.72**	**0.70**	**0.71**	**0.71**	**0.70**
P	Size	0.58	**0.77**	**0.73**	**0.74**	**0.73**	**0.73**
EPS	Value	0.56	**0.67**	**0.69**	**0.68**	**0.69**	**0.69**
POUT	Value	0.52	**0.68**	**0.69**	**0.66**	**0.67**	**0.69**
TV_3M	Size	0.55	0.64	0.62	0.64	**0.65**	0.62
LNMV	Growth0.57		**0.72**	**0.68**	**0.68**	**0.67**	**0.68**
NTAV_18M	Value	0.57	**0.67**	0.60	0.59	0.62	0.60
TV_1M	Size	0.52	**0.67**	0.62	0.63	0.58	0.62
BTMV_18M	Momentum	0.57	**0.68**	0.58	0.55	0.57	0.58
NTAV_24M	Liquidity	0.58	**0.71**	0.64	0.64	0.64	0.64
STTD	Size	0.51	**0.65**	0.60	0.58	0.60	0.60
CFOPS	Liquidity	0.51	**0.67**	0.63	0.64	0.60	0.63
LCPS	Value	0.57	**0.66**	**0.69**	**0.67**	**0.65**	**0.69**
CASHPS	Value	0.56	**0.66**	**0.67**	0.57	0.65	**0.67**
PNAV_12M	Size	0.53	**0.71**	**0.68**	**0.66**	**0.67**	**0.68**
TDTTA	Risk	0.51	0.65	0.62	0.63	0.61	0.62
DPS_12M	Value	0.47	**0.66**	0.63	0.60	0.55	0.63
TV	Value	0.50	**0.68**	0.64	0.59	0.53	0.64
PTCA	Value	0.55	0.61	0.58	0.59	0.58	0.58
Mean		0.54	0.68	0.65	0.63	0.63	0.65
Standard deviation		0.03	0.04	0.04	0.05	0.05	0.04

D.13. Results of the nonparametric Sign Test on Unadjusted Attributes

Values below 0.05 are significant at the 5% level in the nonparametric Sign Test which tests the null hypothesis that the models predict the correct sign less than 50% of the time. The forecasted payoff sign directions are tested against the actual payoff sign directions. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the value, the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The best timing model has been highlighted.

Attribute	Grouping	Model Type 1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	0.00	0.00	0.00	0.00	0.00	0.00
LNCAPS	Size	0.00	0.00	0.00	0.00	0.00	0.00
NTAV_18M	Value	0.02	0.00	0.00	0.00	0.00	0.00
PNAV_12M	Value	0.00	0.00	0.00	0.00	0.00	0.00
EPS	Size	0.02	0.00	0.00	0.00	0.00	0.00
POUT	Growth	0.00	0.00	0.00	0.00	0.00	0.00
NTAV_24M	Value	0.02	0.00	0.00	0.00	0.00	0.00
LNMV	Size	0.04	0.00	0.00	0.00	0.00	0.00
P_12M	Momentum	0.02	0.00	0.00	0.00	0.00	0.00
VO_3M	Liquidity	0.04	0.00	0.00	0.00	0.00	0.00
MV	Size	0.00	0.00	0.00	0.00	0.00	0.00
TV_3M	Liquidity	0.04	0.00	0.00	0.00	0.00	0.00
PNAV_18M	Value	0.01	0.00	0.00	0.00	0.00	0.00
PSALES_6M	Value	0.02	0.00	0.00	0.00	0.00	0.00
CASHPS	Size	0.02	0.00	0.00	0.00	0.00	0.00
INTCOVER_BT	Risk	0.03	0.00	0.00	0.00	0.00	0.00
PSALES_3M	Value	0.00	0.00	0.00	0.00	0.00	0.00
PNAV_6M	Value	0.01	0.00	0.00	0.00	0.00	0.00
BTMV_18M	Value	0.02	0.00	0.00	0.00	0.01	0.02
LCPS	Size	0.00	0.00	0.00	0.00	0.00	0.00
DEBTNTAV	Risk	0.04	0.00	0.00	0.01	0.00	0.02
TV_1M	Liquidity	0.02	0.00	0.00	0.00	0.00	0.00
RI_18M	Momentum	0.01	0.00	0.00	0.01	0.02	0.03
TLCTA	Risk	0.04	0.00	0.01	0.00	0.00	0.00
EPS_3M	Growth	0.01	0.00	0.01	0.02	0.03	0.00
NPBT_18M	Growth	0.06	0.00	0.00	0.01	0.01	0.01
PTCA	Value	0.01	0.00	0.00	0.02	0.01	0.06
P_6M	Momentum	0.05	0.00	0.00	0.01	0.00	0.00
BTMV	Value	0.00	0.00	0.00	0.00	0.00	0.00
CFOPS	Size	0.06	0.00	0.00	0.01	0.00	0.00
DPS_12M	Growth	0.06	0.00	0.00	0.02	0.01	0.01
BORROW_RATIO	Risk	0.05	0.00	0.00	0.03	0.01	0.03
DPS_18M	Growth	0.06	0.00	0.01	0.00	0.01	0.06
STCL	Risk	0.05	0.00	0.02	0.03	0.01	0.03
Mean		0.02	0.00	0.00	0.01	0.00	0.01
Standard deviation		0.02	0.00	0.00	0.01	0.01	0.02

D.14. Results of the nonparametric Sign Test on CAPM risk adjusted Attributes

Values below 0.05 are significant at the 5% level in the nonparametric Sign Test which tests the null hypothesis that the models predict the correct sign less than 50% of the time. The forecasted payoff sign directions are tested against the actual payoff sign directions. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the value, the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	0.00	0.00	0.00	0.00	0.00	0.00
POUT	Size	0.01	0.00	0.00	0.00	0.00	0.00
NTAV_18M	Value	0.05	0.00	0.00	0.03	0.00	0.01
NTAV_24M	Value	0.05	0.00	0.00	0.00	0.00	0.01
LNMV	Size	0.00	0.00	0.00	0.00	0.00	0.00
TV_3M	Growth	0.01	0.00	0.00	0.00	0.00	0.00
PNAV_12M	Value	0.00	0.00	0.00	0.00	0.00	0.00
BTMV_18M	Size	0.01	0.00	0.00	0.00	0.01	0.00
TV_1M	Momentum	0.02	0.00	0.00	0.00	0.00	0.00
LCPS	Liquidity	0.01	0.00	0.00	0.00	0.00	0.00
DEBTNTAV	Size	0.02	0.00	0.00	0.00	0.00	0.01
DPS_12M	Liquidity	0.05	0.00	0.00	0.02	0.01	0.02
CASHPS	Value	0.01	0.00	0.00	0.00	0.00	0.00
CFOPS	Value	0.02	0.00	0.00	0.00	0.00	0.00
PNTAV	Size	0.01	0.00	0.00	0.01	0.00	0.00
DPS_18M	Risk	0.06	0.00	0.02	0.00	0.02	0.06
BOR_REPAY_24M	Value	0.05	0.00	0.00	0.01	0.00	0.00
PSALES_3M	Value	0.06	0.00	0.00	0.00	0.00	0.00
EPS_3M	Value	0.01	0.00	0.04	0.01	0.05	0.02
Mean		0.02	0.00	0.00	0.00	0.01	0.01
Standard deviation		0.02	0.00	0.01	0.01	0.01	0.01

D.15. Results of the nonparametric Sign Test on APT risk adjusted Attributes

Values below 0.05 are significant at the 5% level in the nonparametric Sign Test which tests the null hypothesis that the models predict the correct sign less than 50% of the time. The forecasted payoff sign directions are tested against the actual payoff sign directions. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised unadjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the value, the better the style-timing model. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
LNCAPS	Size	0.00	0.00	0.00	0.00	0.00	0.00
P	Size	0.01	0.00	0.00	0.00	0.00	0.00
EPS	Value	0.01	0.00	0.00	0.00	0.00	0.00
POUT	Value	0.05	0.00	0.00	0.00	0.00	0.00
TV_3M	Size	0.02	0.00	0.00	0.00	0.00	0.00
LNMV	Growth	0.01	0.00	0.00	0.00	0.00	0.00
NTAV_18M	Value	0.01	0.00	0.00	0.01	0.00	0.00
TV_1M	Size	0.05	0.00	0.00	0.00	0.00	0.00
BTMV_18M	Momentum	0.01	0.00	0.01	0.03	0.01	0.01
NTAV_24M	Liquidity	0.01	0.00	0.00	0.00	0.00	0.00
STTD	Size	0.05	0.00	0.00	0.00	0.00	0.00
CFOPS	Liquidity	0.06	0.00	0.00	0.00	0.00	0.00
LCPS	Value	0.01	0.00	0.00	0.00	0.00	0.00
CASHPS	Value	0.01	0.00	0.00	0.01	0.00	0.00
PNAV_12M	Size	0.04	0.00	0.00	0.00	0.00	0.00
TDTTA	Risk	0.06	0.00	0.00	0.00	0.00	0.00
DPS_12M	Value	0.05	0.00	0.00	0.00	0.02	0.00
TV	Value	0.06	0.00	0.00	0.00	0.04	0.00
PTCA	Value	0.02	0.00	0.01	0.00	0.00	0.01
Mean		0.03	0.00	0.00	0.00	0.00	0.00
Standard deviation		0.02	0.00	0.00	0.01	0.01	0.00

D.16. Sum of Absolute t-statistics for the regression coefficients

Displays the sum of the absolute t-statistics of the intercept and beta coefficients from regressions performed with the payoffs to each attribute as dependent variable and the forecasted values as the independent variable. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	6.68	7.19	5.94	4.06	2.65	1.79
POUT	Size	6.18	7.69	4.83	3.56	3.14	7.70
NTAV_18M	Value	5.66	7.43	5.90	4.67	4.06	13.14
NTAV_24M	Value	5.16	5.77	5.19	3.60	2.90	8.30
LNMV	Size	4.55	6.80	5.01	3.75	1.93	18.95
TV_3M	Growth	4.41	6.16	3.25	4.27	3.42	20.16
PNAV_12M	Value	3.49	6.85	4.78	3.94	1.81	8.93
BTMV_18M	Size	3.65	6.86	4.18	3.47	2.08	2.45
TV_1M	Momentum	3.56	6.42	4.58	3.84	5.58	15.04
LCPS	Liquidity	6.89	7.98	5.27	3.70	8.86	3.55
DEBTNTAV	Size	3.51	6.53	4.13	2.77	3.73	1.36
DPS_12M	Liquidity	2.62	7.34	3.85	2.95	5.01	2.39
CASHPS	Value	3.59	6.58	6.57	3.15	13.21	6.91
CFOPS	Value	3.13	4.43	4.53	3.27	5.00	10.36
PNTAV	Size	4.39	7.27	5.10	4.26	2.73	16.76
DPS_18M	Risk	2.20	6.96	3.57	2.83	2.44	3.28
BOR_REPAY_24M	Value	3.53	6.25	3.93	3.98	2.28	2.64
PSALES_3M	Value	2.94	5.98	5.05	3.35	3.09	0.91
EPS_3M	Value	3.06	5.33	2.97	4.42	3.18	16.32
Mean		**4.17**	**6.62**	**4.66**	**3.68**	**4.06**	**8.47**
Standard deviation		1.36	0.86	0.94	0.54	**2.77**	**6.50**

D.17. Sum of Absolute t-statistics for the regression coefficients

Displays the sum of the absolute t-statistics of the intercept and beta coefficients from regressions performed with the payoffs to each attribute as dependent variable and the forecasted values as the independent variable. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The best timing model has been highlighted.

Attribute	Grouping	Model Type 1MA	6MA12M	A	18MA	Historic Mean	AR12
LNCAPS	Size	6.72	5.79	3.91	4.05	2.79	3.91
P	Size	6.10	7.27	5.10	3.85	2.89	5.10
EPS	Value	5.76	7.01	4.41	3.71	3.08	4.41
POUT	Value	5.73	6.93	4.45	3.27	3.56	4.45
TV_3M	Size	4.14	6.48	3.75	2.64	3.60	3.75
LNMV	Growth	4.14	6.74	4.71	3.58	2.12	4.71
NTAV_18M	Value	3.62	7.84	5.03	3.68	4.73	5.03
TV_1M	Size	4.54	6.84	4.58	3.84	5.48	4.58
BTMV_18M	Momentum	4.68	6.33	4.32	3.86	2.10	4.32
NTAV_24M	Liquidity	3.24	6.55	5.51	3.89	3.93	5.51
STTD	Size	3.39	6.80	4.48	3.44	3.87	4.48
CFOPS	Liquidity	3.77	4.00	5.75	3.85	5.51	5.75
LCPS	Value	7.43	7.68	5.21	3.69	8.65	5.21
CASHPS	Value	3.85	7.49	6.93	3.58	13.34	6.93
PNAV_12M	Size	4.18	5.94	5.27	4.73	1.89	5.27
TDTTA	Risk	3.07	6.14	4.36	4.04	3.53	4.36
DPS_12M	Value	2.38	6.82	3.77	3.04	5.35	3.77
TV	Value	2.29	7.58	5.89	4.56	2.87	5.89
PTCA	Value	2.68	5.24	4.51	3.46	3.52	4.51
Mean		4.30	**6.60**	4.84	3.73	4.36	4.84
Standard deviation		1.46	0.92	0.80	0.47	2.69	0.80

D.18. Average Theil Inequality Coefficient for Style-timing Models

Theil (1958) Inequality Coefficients are calculated for each standardised style characteristic for each style-timing model. The Theil Inequality Coefficient lies between zero and one. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised CAPM risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the coefficient, the better the style-timing model. Values below 0.6 are displayed on bold. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
P	Size	0.64	**0.52**	**0.56**	0.60	0.64	0.65
POUT	Size	0.67	**0.52**	0.61	0.64	0.67	0.61
NTAV_18M	Value	0.68	**0.52**	**0.57**	0.62	0.65	**0.57**
NTAV_24M	Value	0.71	**0.59**	0.61	0.66	0.69	0.66
LNMV	Size	0.74	**0.57**	0.63	0.67	0.72	**0.42**
TV_3M	Growth	0.74	**0.59**	0.70	0.67	0.71	**0.43**
PNAV_12M	Value	0.79	**0.58**	0.65	0.68	0.77	0.68
BTMV_18M	Size	0.78	**0.58**	0.69	0.71	0.76	0.77
TV_1M	Momentum	0.80	0.61	0.66	0.67	0.72	**0.36**
LCPS	Liquidity	0.67	**0.56**	0.66	0.74	0.63	0.77
DEBTNTAV	Size	0.81	0.61	0.71	0.78	0.76	0.85
DPS_12M	Liquidity	0.83	**0.59**	0.72	0.76	0.75	0.84
CASHPS	Value	0.82	0.62	0.63	0.78	**0.53**	0.71
CFOPS	Value	0.83	0.72	0.73	0.71	0.73	0.66
PNTAV	Size	0.78	**0.59**	0.67	0.71	0.79	**0.40**
DPS_18M	Risk	0.85	**0.59**	0.74	0.77	0.79	0.82
BOR_REPAY_24M	Value	0.81	0.62	0.72	0.71	0.80	0.83
PSALES_3M	Value	0.85	0.64	0.68	0.76	0.81	0.86
EPS_3M	Value	0.85	0.67	0.78	0.74	0.81	**0.49**
Mean		0.77	0.59	0.67	0.70	0.72	0.65
Standard deviation		0.07	0.05	0.06	0.05	0.07	0.17

D.19. Average Theil Inequality Coefficient for Style-timing Models

Theil (1958) Inequality Coefficients are calculated for each standardised style characteristic for each style-timing model. The Theil Inequality Coefficient lies between zero and one. The realised monthly payoffs are derived from univariate cross-sectional regressions on standardised APT risk adjusted total monthly returns data over the period 31 January 1989 to 31 July 2005. The data were extracted from DataStream International, available at the University of Cape Town. The lower the coefficient, the better the style-timing model. Values below 0.6 are displayed on bold. The best timing model has been highlighted.

Attribute	Grouping	Model Type					
		1MA	6MA	12MA	18MA	Historic Mean	AR12
LNCAPS	Size	0.62	**0.53**	**0.59**	**0.59**	0.61	**0.59**
P	Size	0.66	**0.52**	**0.58**	0.62	0.65	**0.58**
EPS	Value	0.67	**0.53**	0.61	0.62	0.64	0.61
POUT	Value	0.69	**0.55**	0.63	0.67	0.68	0.63
TV_3M	Size	0.74	**0.58**	0.68	0.70	0.70	0.68
LNMV	Growth	0.75	**0.57**	0.64	0.69	0.74	0.64
NTAV_18M	Value	0.77	**0.55**	0.64	0.69	0.70	0.64
TV_1M	Size	0.76	**0.59**	0.66	0.68	0.70	0.66
BTMV_18M	Momentum	0.75	0.61	0.68	0.70	0.75	0.68
NTAV_24M	Liquidity	0.79	**0.59**	0.64	0.71	0.74	0.64
STTD	Size	0.80	**0.59**	0.67	0.70	0.74	0.67
CFOPS	Liquidity	0.81	0.72	0.69	0.69	0.71	0.69
LCPS	Value	0.65	**0.58**	0.66	0.74	0.64	0.66
CASHPS	Value	0.81	**0.58**	0.61	0.76	**0.53**	0.61
PNAV_12M	Size	0.81	0.64	0.68	0.72	0.81	0.68
TDTTA	Risk	0.83	0.63	0.71	0.73	0.79	0.71
DPS_12M	Value	0.85	0.62	0.73	0.76	0.76	0.73
TV	Value	0.86	**0.59**	0.66	0.72	0.81	0.66
PTCA	Value	0.86	0.68	0.72	0.76	0.81	0.72
Mean		0.76	0.59	0.66	0.70	0.71	0.66
Standard deviation		0.07	0.05	0.04	0.05	0.07	0.04

Appendix E

E.1. Significant Attributes specific to the Basic Materials sector

Basic Materials are comprised of resource and basic materials firms. Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period January 1989 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic.. The table displays the attributes significant at the 5% level using Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	Unadjusted returns		CAPM risk adjusted returns		APT risk adjusted returns	
		T statistic	Mean beta	T statistic	Mean beta	T statistic	Mean beta
NTAV_18M	Value	**5.845**	0.009	**4.964**	0.008	**4.775**	0.007
POUT	Growth	**-5.648**	-0.007	**-6.025**	-0.008	**-5.179**	-0.006
P	Size	**-5.325**	-0.008	**-4.948**	-0.013	**-4.403**	-0.012
PNAV_12M	Value	**5.044**	0.008	**4.587**	0.008	**4.409**	0.007
LNCAPS	Size	**-4.793**	-0.008	**-4.671**	-0.009	**-4.776**	-0.008
NTAV_24M	Value	**4.041**	0.006	**3.648**	0.006	**3.519**	0.005
PSALES_6M	Value	**3.974**	0.006	**3.512**	0.006	**3.702**	0.006
PNAV_18M	Value	**3.915**	0.006	**3.092**	0.005	**3.192**	0.005
MV	Size	**-3.906**	-0.004	**-5.242**	-0.008	**-4.632**	-0.007
PSALES_3M	Value	**3.872**	0.005	**3.282**	0.005	**3.978**	0.006
LNMV	Size	**-3.737**	-0.008	**-3.802**	-0.022	**-3.317**	-0.018
EPS	Size	**-3.720**	-0.004	**-3.382**	-0.004	**-2.435**	-0.003
VO_3M	Liquidity	**3.587**	0.007	**2.881**	0.010	**2.852**	0.009
TV	Liquidity	**3.580**	0.004	**2.974**	0.004	**2.419**	0.003
PNAV_6M	Value	**3.205**	0.006	**2.749**	0.005	**3.249**	0.006
TV_3M	Liquidity	**3.135**	0.004	**2.984**	0.004	**3.030**	0.004
NPBT_18M	Growth	**2.833**	0.004	**2.884**	0.004	**2.540**	0.003
EPS_3M	Growth	**2.565**	0.003	**2.470**	0.003	**2.901**	0.003
BORROW_RATIO	Risk	**-2.399**	-0.004	**-2.728**	-0.005	**-2.699**	-0.004
LCPS	Size	**-2.308**	-0.270	**-2.076**	-0.246	**-2.371**	-0.223
DEBTNTAV	Risk	**-2.291**	-0.004	**-2.156**	-0.004	**-2.716**	-0.004
CASHPS	Size	**-2.275**	-0.079	-1.259	-0.051	-1.579	-0.061
INTCOVER_BT	Risk	**2.185**	0.003	1.551	0.002	1.606	0.002
P_12M	Momentum	**2.168**	0.004	0.403	0.001	0.238	0.001
PTCA	Value	**2.053**	0.003	**2.005**	0.003	1.904	0.003
BTMV_18M	Value	1.957	0.003	**2.201**	0.004	1.678	0.003
TLCTA	Risk	-1.884	-0.002	**-2.302**	-0.003	**-2.220**	-0.003
TDTTA	Risk	-1.647	-0.002	**-2.133**	-0.003	**-2.019**	-0.002
RI_18M	Momentum	1.494	0.003	0.189	0.001	-0.017	0.000
DPS_12M	Growth	1.471	0.002	**2.383**	0.003	1.665	0.002
BOR_REPAY_24M	Growth	-1.358	-0.002	-1.299	-0.001	-1.851	-0.002
P_6M	Momentum	1.341	0.003	0.327	0.001	0.245	0.001
STCL	Risk	-1.069	-0.001	-1.691	-0.002	-0.909	-0.001
BTMV	Value	0.975	0.001	1.289	0.002	1.042	0.001
DPS_18M	Growth	0.629	0.001	1.740	0.002	1.139	0.001
STTD	Risk	0.511	0.001	0.882	0.001	1.339	0.001
TV_1M	Liquidity	0.507	0.001	0.926	0.001	1.279	0.001
PNTAV	Value	-0.274	0.000	-0.323	0.000	-0.293	0.000
CFOPS	Size	0.044	0.000	-0.163	-0.001	0.144	0.001

E.2. Significant Attributes specific to the Cyclicals sector

Cyclicals are made up with firms from cyclical goods and services, financials and general industries. Non-Cyclicals are comprised of Utilities, information technology and non-cyclical goods and services. Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period January 1989 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic.. The table displays the attributes significant at the 5% level using Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	Unadjusted returns		CAPM risk adjusted returns		APT risk adjusted returns	
		T statistic	Mean beta	T statistic	Mean beta	T statistic	Mean beta
NTAV_18M	Value	**4.582**	0.007	**3.452**	0.006	**3.772**	0.006
POUT	Growth	**-3.968**	-0.006	**-3.413**	-0.009	**-3.232**	-0.008
P	Size	**-4.823**	-0.008	**-3.614**	-0.013	**-3.323**	-0.012
PNAV_12M	Value	**4.044**	0.008	0.860	0.004	0.971	0.004
LNCAPS	Size	**-4.954**	-0.009	**-2.889**	-0.008	**-3.057**	-0.008
NTAV_24M	Value	**3.172**	0.005	**2.509**	0.005	**2.739**	0.005
PSALES_6M	Value	**2.620**	0.005	-0.119	-0.001	-0.224	-0.001
PNAV_18M	Value	**2.706**	0.006	0.418	0.002	0.337	0.001
MV	Size	**-2.952**	-0.004	**-3.253**	-0.007	**-3.065**	-0.007
PSALES_3M	Value	**2.371**	0.005	0.827	0.002	0.727	0.002
LNMV	Size	**-2.733**	-0.007	**-2.320**	-0.019	**-2.168**	-0.017
EPS	Size	**-3.203**	-0.004	**-3.833**	-0.004	**-4.133**	-0.004
VO_3M	Liquidity	**2.134**	0.004	**2.073**	0.007	**2.353**	0.008
TV	Liquidity	1.478	0.002	1.693	0.003	**2.464**	0.003
PNAV_6M	Value	**2.125**	0.005	**-0.316**	-0.003	**-0.068**	-0.001
TV_3M	Liquidity	1.727	0.002	1.868	0.002	**2.477**	0.003
NPBT_18M	Growth	0.980	0.002	1.250	0.002	1.313	0.002
EPS_3M	Growth	1.749	0.002	1.468	0.002	1.694	0.002
BORROW_RATIO	Risk	-1.500	-0.004	-1.385	-0.011	-1.449	-0.011
LCPS	Size	-1.258	-0.112	-1.643	-0.133	-1.637	-0.135
DEBTNTAV	Risk	-1.496	-0.002	-1.521	-0.004	-1.348	-0.003
CASHPS	Size	-1.514	-0.020	0.177	0.003	-1.425	-0.017
INTCOVER_BT	Risk	1.959	0.002	1.071	0.001	0.577	0.001
P_12M	Momentum	**4.104**	0.009	0.718	0.004	0.469	0.003
PTCA	Value	1.008	0.002	0.231	0.001	0.683	0.001
BTMV_18M	Value	1.825	0.006	1.399	0.017	1.442	0.017
TLCTA	Risk	-1.497	-0.003	-1.237	-0.008	-1.398	-0.009
TDTTA	Risk	-1.448	-0.002	-1.432	-0.007	-1.636	-0.007
RI_18M	Momentum	1.657	0.004	-0.268	-0.002	-0.332	-0.002
DPS_12M	Growth	1.797	0.002	**2.340**	0.003	1.706	0.002
BOR_REPAY_24M	Growth	-0.818	-0.001	-1.071	-0.002	-1.129	-0.002
P_6M	Momentum	1.940	0.005	-0.266	-0.002	-0.440	-0.003
STCL	Risk	-0.803	-0.001	-1.217	-0.007	-1.325	-0.007
BTMV	Value	1.365	0.008	1.126	0.029	1.132	0.028
DPS_18M	Growth	1.557	0.002	**1.983**	0.003	1.401	0.002
STTD	Risk	**2.204**	0.003	**1.982**	0.004	**2.185**	0.004
TV_1M	Liquidity	0.820	0.001	1.178	0.002	**2.103**	0.003
PNTAV	Value	-1.018	-0.002	-1.135	-0.006	-0.860	-0.004
CFOPS	Size	-1.420	-0.004	-1.520	-0.008	-1.546	-0.007

E.3. Significant Attributes specific to the Non-Cyclicals sector

Non-Cyclicals are comprised of Utilities, information technology and non-cyclical goods and services. Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period January 1989 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic.. The table displays the attributes significant at the 5% level using Student's (1908) t-test. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Grouping	Unadjusted returns		CAPM risk adjusted returns		APT risk adjusted returns	
		T statistic	Mean beta	T statistic	Mean beta	T statistic	Mean beta
NTAV_18M	Value	**3.445**	0.007	**3.113**	0.006	**2.741**	0.006
POUT	Growth	**-3.458**	-0.006	**-3.571**	-0.007	**-3.679**	-0.007
P	Size	**-5.820**	-0.009	**-6.440**	-0.011	**-6.251**	-0.010
PNAV_12M	Value	**4.834**	0.012	**4.260**	0.012	**3.688**	0.010
LNCAPS	Size	**-4.328**	-0.010	**-4.402**	-0.010	**-4.821**	-0.010
NTAV_24M	Value	**2.417**	0.005	1.899	0.004	1.870	0.004
PSALES_6M	Value	**2.834**	0.006	**2.515**	0.006	**2.031**	0.005
PNAV_18M	Value	**4.223**	0.010	**3.586**	0.009	**2.661**	0.006
MV	Size	**-2.374**	-0.003	**-3.070**	-0.003	**-3.489**	-0.004
PSALES_3M	Value	**3.459**	0.007	**3.281**	0.007	**3.183**	0.007
LNMV	Size	**-2.986**	-0.006	**-3.730**	-0.009	**-3.599**	-0.009
EPS	Size	**-3.537**	-0.005	**-3.216**	-0.004	**-3.831**	-0.005
VO_3M	Liquidity	1.076	0.002	1.018	0.002	1.315	0.003
TV	Liquidity	1.212	0.002	1.059	0.002	0.887	0.002
PNAV_6M	Value	**3.235**	0.008	**2.949**	0.008	**2.553**	0.006
TV_3M	Liquidity	1.638	0.003	1.877	0.003	**2.145**	0.004
NPBT_18M	Growth	-0.446	-0.002	-0.620	-0.003	-0.786	-0.004
EPS_3M	Growth	-0.452	-0.001	-0.748	-0.001	-0.540	-0.001
BORROW_RATIO	Risk	0.668	0.001	0.429	0.001	-0.175	0.000
LCPS	Size	**-3.293**	-0.005	**-3.346**	-0.005	**-4.089**	-0.006
DEBTNTAV	Risk	-1.320	-0.003	-1.419	-0.003	-1.739	-0.004
CASHPS	Size	**-4.446**	-0.005	**-4.161**	-0.005	**-3.497**	-0.004
INTCOVER_BT	Risk	0.412	0.001	0.320	0.000	-0.251	0.000
P_12M	Momentum	**3.708**	0.010	**3.041**	0.009	**2.955**	0.008
PTCA	Value	1.234	0.003	0.971	0.002	1.131	0.002
BTMV_18MVal	ue	1.511	0.004	1.867	0.005	1.962	0.005
TLCTA	Risk	-0.403	-0.001	-0.840	-0.001	-1.400	-0.002
TDTTA	Risk	0.123	0.000	-0.138	0.000	-0.601	-0.001
RI_18M	Momentum	**2.334**	0.006	1.878	0.005	1.918	0.005
DPS_12M	Growth	0.455	0.001	0.609	0.001	0.430	0.001
BOR_REPAY_24M	Growth	0.206	0.001	-0.051	0.000	0.244	0.001
P_6M	Momentum	**2.267**	0.006	1.404	0.004	1.290	0.003
STCL	Risk	-1.202	-0.002	-1.280	-0.002	-1.437	-0.002
BTMV	Value	1.091	0.002	1.369	0.003	1.393	0.003
DPS_18M	Growth	-0.472	-0.001	-0.390	-0.001	-0.733	-0.001
STTD	Risk	-0.102	0.000	0.223	0.000	0.843	0.001
TV_1M	Liquidity	0.312	0.000	0.314	0.001	-0.002	0.000
PNTAV	Value	-1.109	-0.002	-1.387	-0.003	-1.518	-0.003
CFOPS	Size	-0.840	-0.002	-0.971	-0.003	-1.477	-0.004

E.4. Significant Attributes specific to three identified sectors

Basic Materials are comprised of resource and basic materials firms. Cyclicals are made up with firms from cyclical goods and services, financials and general industries. Non-Cyclicals are comprised of utilities, information technology and non-cyclical goods and services. Univariate cross-sectional regressions of standardised firm-specific attributes on unadjusted total monthly returns data over the period January 1989 to July 2005 are performed and give rise to a time-series of regression slope coefficients for each characteristic.. The table displays the attributes significant at the 5% level using Student's (1908) t-test in ascending order of significance. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Basic materials	Cyclicals	Non Cyclicals
Attribute	Attribute	Attribute
NTAV_18M	NTAV_18M	NTAV_18M
POUT	POUT	POUT
P	P	P
PNAV_12M	LNCAPS	PNAV_12M
LNCAPS	NTAV_24M	LNCAPS
NTAV_24M	MV	PSALES_6M
PSALES_6M	LNMV	PNAV_18M
PNAV_18M	EPS	MV
MV	VO_3M	PSALES_3M
PSALES_3M	TV	LNMV
LNMV	PNAV_6M	EPS
EPS	TV_3M	PNAV_6M
VO_3M	STTD	TV_3M
TV	TV_1M	LCPS
PNAV_6M		CASHPS
TV_3M		P_12M
NPBT_18M		
EPS_3M		
BORROW_RATIO		
LCPS		
DEBTNTAV		

E.5. Results from the Portfolio trading strategy using Quintiles

The table displays the annual average return and Sharpe ratio for each attribute's highest and lowest quintile portfolios using unadjusted monthly returns. The same measures for the equally weighted market portfolio (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. Attributes that show higher annual returns at a lower risk than the benchmark are emboldened. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes

Unadjusted Results

	Highest Portfolio		Lowest Portfolio	
Attribute	Annual Average Return	Sharpe ratio	Annual Average Return	Sharpe ratio
P	4.70%	0.11	**44.41%**	**0.48**
LNCAPS	7.67%	0.16	**40.20%**	**0.46**
NTAV_18M	**38.77%**	**0.55**	1.19%	0.05
PNAV_12M	**38.47%**	**0.51**	5.44%	0.10
EPS	9.05%	0.21	**26.87%**	0.40
POJT	10.88%	0.26	**28.82%**	0.37
NTAV_24M	**34.07%**	**0.50**	4.43%	0.09
LNMV	13.55%	0.30	**38.54%**	**0.43**
P_12M	**44.81%**	**0.53**	10.27%	0.15
VO_3M	**31.63%**	**0.46**	15.85%	0.28
MV	13.67%	0.30	**38.32%**	**0.43**
TV_3M	**27.97%**	**0.45**	15.94%	0.30
PNAV_18M	**32.58%**	**0.44**	10.12%	0.16
PSALES_6M	**29.66%**	**0.43**	10.75%	0.17
CASHPS	8.04%	0.16	**31.40%**	**0.48**
INTCOVER_BT	**32.25%**	**0.53**	-2.86%	-0.01
PSALES_3M	**30.68%**	**0.45**	12.94%	0.20
PNAV_6M	**31.79%**	**0.42**	10.30%	0.16
BTMV_18M	**26.59%**	0.34	15.64%	0.23
LCPS	9.44%	0.21	**32.54%**	**0.44**
DEBTNTAV	12.91%	0.27	**23.34%**	0.34
TV_1M	**25.77%**	**0.42**	17.44%	0.32
ENTAV	11.77%	0.21	**26.99%**	0.39
RI_18M	**37.16%**	**0.45**	17.48%	0.23
TLCTA	15.58%	0.32	18.45%	0.32
EPS_3M	20.37%	0.38	10.40%	0.19
NPBT_18M	**24.75%**	0.39	13.50%	0.21
ETCA	**25.91%**	0.37	18.83%	0.28
P_6M	**37.46%**	**0.47**	14.96%	0.21
BTMV	**31.04%**	**0.45**	13.85%	0.22
CFOPS	8.31%	0.14	**22.94%**	0.20
DPS_12M	20.75%	**0.43**	11.92%	0.23
BORROW_RATIO	17.11%	0.33	18.23%	0.29
DPS_18M	19.83%	0.39	10.72%	0.21
STCL	18.61%	0.36	**23.21%**	0.36
BOR_REPAY_24M	14.93%	0.28	19.05%	0.34
TCTTA	17.75%	0.34	17.33%	0.30
STTD	20.84%	0.36	14.15%	0.27
TV	**22.10%**	0.31	17.19%	0.37
Equal weighted market portfolio	Annual Average Return	**21.85%**	**Sharpe ratio**	**0.41**

E.6. Results from the Portfolio trading strategy using Quintiles

The table displays the annual average return and Sharpe ratio for each attribute's highest and lowest quintile portfolios using CAPM risk adjusted monthly returns. The same measures for the equally weighted market portfolio (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. Attributes that show higher annual returns at a lower risk than the benchmark are in bold. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

CAPM Risk Adjusted Results(Quintiles)

	Highest Portfolio		Lowest Portfolio	
Attribute	Annual Average Return	Sharpe ratio	Annual Average Return	Sharpe ratio
P	-2.08%	-0.06	**44.56%**	**0.53**
LNCAPS	1.76%	0.06	**33.17%**	**0.45**
NTAV_18M	**26.88%**	**0.59**	-3.94%	-0.07
PNAV_12M	**27.94%**	**0.52**	0.01%	0.02
EPS	2.16%	0.08	**19.54%**	0.43
POUT	2.34%	0.10	**22.19%**	0.39
NTAV_24M	**21.97%**	**0.52**	2.24%	-0.03
LNMV	4.68%	0.20	**40.63%**	**0.52**
P_12M	**36.77%**	**0.56**	7.97%	0.15
VO_3M	**26.22%**	**0.47**	9.88%	0.24
MV	4.68%	0.20	**40.38%**	**0.51**
TV_3M	**20.04%**	0.44	8.15%	0.23
PNAV_18M	**22.16%**	0.43	5.19%	0.12
PSALES_6M	**20.65%**	0.45	5.73%	0.13
CASHPS	1.41%	0.06	**22.85%**	**0.45**
INTCOVER_BT	**21.68%**	**0.58**	-6.62%	-0.10
PSALES_3M	21.97%	0.45	6.97%	0.17
PNAV_6M	**23.23%**	0.44	5.82%	0.13
BTMV_18M	19.19%	0.35	7.96%	0.18
LCPS	2.82%	0.10	**24.23%**	0.44
DEBTNTAV	5.27%	0.18	**15.84%**	0.36
TV_1M	**18.50%**	0.42	10.02%	0.29
PNTAV	5.16%	0.15	**19.49%**	0.37
RI_18M	29.93%	**0.47**	**14.69%**	0.24
TLCTA	7.21%	0.25	9.54%	0.27
EPS_3M	10.90%	0.31	3.31%	0.10
NPBT_18M	**15.56%**	0.39	5.87%	0.15
PTCA	**18.55%**	0.35	10.09%	0.24
P_6M	**30.49%**	**0.49**	13.62%	0.24
BTMV	**23.99%**	**0.46**	6.49%	0.16
CFOPS	1.57%	0.05	**17.34%**	0.16
DPS_12M	11.46%	0.34	3.24%	0.11
BORROW_RATIO	9.01%	0.28	12.33%	0.29
DPS_18M	10.77%	0.31	1.58%	0.06
STCL	10.49%	0.30	**16.12%**	0.36
BOR_REPAY_24M	4.92%	0.16	8.73%	0.24
TDTTA	9.83%	0.29	9.86%	0.27
STTD	13.03%	0.35	7.00%	0.21
TV	13.73%	0.31	10.47%	0.32
Equal weighted market portfolio	Annual Average Return	**14.31%**	Sharpe ratio	**0.45**

E.7. Results from the Portfolio trading strategy using Quintiles

The table displays the annual average return and Sharpe ratio for each attribute's highest and lowest quintile portfolios using APT risk adjusted monthly returns. The same measures for the equally weighted market portfolio (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied to newly acquired and removed portfolio shares. Attributes that show higher annual returns at a lower risk than the benchmark are in bold. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm specific attributes.

APT Risk Adjusted Results(Quintiles)

	Highest Portfolio		Lowest Portfolio	
Attribute	Annual Average Return	Sharpe ratio	Annual Average Return	Sharpe ratio
P	1.58%	0.07	**38.37%**	**0.51**
LNCAPS	1.45%	0.06	**32.21%**	**0.54**
NTAV_18M	**24.91%**	**0.58**	-0.73%	0.00
PNAV_12M	**27.05%**	**0.57**	4.43%	0.12
EPS	1.62%	0.07	**19.36%**	0.46
FCUT	3.71%	0.15	**19.94%**	0.34
NTAV_24M	**21.85%**	**0.53**	0.03%	0.02
LNMV	5.00%	0.27	**33.27%**	0.44
P_12M	**33.92%**	**0.58**	10.54%	0.22
VO_3M	**27.88%**	**0.54**	6.64%	0.22
MV	5.99%	0.27	**33.07%**	0.43
TV_3M	**21.98%**	**0.54**	6.07%	0.23
PNAV_18M	**23.25%**	**0.52**	6.32%	0.20
PSALES_6M	**21.50%**	0.47	7.18%	0.19
CASHPS	6.13%	0.19	**21.04%**	**0.51**
INTCOVER_BT	**19.58%**	**0.58**	-2.73%	-0.03
PSALES_3M	**23.01%**	**0.49**	6.63%	0.10
PNAV_6M	**25.51%**	**0.48**	6.30%	0.17
BTMV_18M	**20.45%**	0.43	8.82%	0.21
LCPS	4.64%	0.16	**27.82%**	**0.55**
DEBTNTAV	5.63%	0.18	**17.67%**	0.41
TV_1M	**19.65%**	**0.52**	11.52%	0.33
PNTAV	8.35%	0.24	13.09%	0.28
RI_18M	**30.75%**	**0.53**	14.71%	0.27
TLCTA	6.84%	0.22	13.62%	0.35
EPS_3M	10.59%	0.34	5.52%	0.17
NEBT_18M	14.34%	0.41	10.27%	0.25
FTCA	**19.94%**	0.43	5.44%	0.14
P_6M	**31.14%**	**0.54**	14.71%	0.30
BTMV	**18.84%**	0.40	9.08%	0.24
CFOPS	1.49%	0.05	**20.98%**	0.19
DPS_12M	12.82%	0.36	5.45%	0.19
BORROW_RATIO	8.02%	0.21	**17.95%**	0.42
DPS_18M	11.47%	0.34	3.71%	0.13
STCL	6.69%	0.27	**18.10%**	0.40
BOR_REPAY_24M	6.86%	0.18	10.67%	0.34
TDTIA	6.93%	0.24	**15.30%**	0.39
STTD	**16.57%**	0.43	7.93%	0.26
TV	**15.60%**	0.44	10.20%	0.30
Equal weighted market portfolio	Annual Average Return	14.82%	Sharpe ratio	0.46

E.8. Common attributes from all unadjusted and risk adjusted return samples

The table displays the annual average return for the common attribute's best portfolios among the unadjusted, CAPM risk adjusted and APT risk adjusted monthly returns . The annual average returns for the equally weighted market portfolios (benchmark) are calculated on the bottom row. The share returns are sorted monthly according to each attribute and two portfolios are created containing the highest and lowest quintiles of the monthly data. Each month, transaction costs of 1% for 'buying' and 'selling' are applied for newly included and removed shares. Attributes that show higher annual returns at a lower risk than the benchmark are shown in bold. The portfolios provide insight into the viability of trading strategies using the significant style based attributes derived from the univariate tests of Chapter Six. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Best Quintile Portfolio		
	Unadjusted annual return	CAPM annual return	APT annual return
P	44.41%	44.56%	38.37%
LNCAPS	40.20%	33.17%	32.21%
NTAV_18M	38.77%	26.88%	24.91%
PNAV_12M	38.47%	27.94%	27.05%
NTAV_24M	34.07%	21.97%	21.85%
P_12M	44.81%	36.77%	33.92%
VO_3M	31.63%	26.22%	27.88%
CASHPS	31.40%	22.65%	21.04%
INTCOVER_BT	32.25%	21.68%	19.58%
RI_18M	37.16%	29.93%	30.75%
P_6M	37.46%	30.49%	31.14%
Equal weighted market portfolio	21.85%	14.31%	14.82%

E.9. Attribute's returns during 'down' months for the 40's portfolio sort

The table displays the annual average return for the common attribute's best portfolios among the unadjusted sample for 'down' months. The annual average returns for the equally weighted market portfolios (benchmark) are calculated on the bottom row. 'Down' months refer to months in which the benchmark delivered a negative return. The portfolio methodology is discussed in Section 8.2. and the attributes derived from the univariate tests of Chapter Six. The parametric ANOVA test tests the null hypothesis that the population means of the monthly returns for the market and attribute portfolio are identical. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Best of the 40 Portfolios	
	Annual Average Return	ANOVA Means Test P value
P	-19.82%	0.41
LNCAPS	-19.86%	0.40
NTAV_18M	-28.20%	0.74
PNAV_12M	-21.50%	0.37
NTAV_24M	-28.27%	0.80
LNMV	-34.24%	0.80
P_12M	-21.36%	0.39
VO_3M	-6.46%	0.10
MV	-34.36%	0.79
TV_3M	-22.34%	0.32
PSALES_6M	-30.67%	0.92
CASHPS	-31.12%	0.98
INTCOVER_BT	-36.46%	0.45
PNAV_6M	-34.45%	0.82
RI_18M	-36.40%	0.72
P_6M	-31.49%	0.98
BTMV	-17.77%	0.14
Equal weighted market portfolio	-31.18%	

E.10. Attribute's returns during 'up' months for the 40's portfolio sort

The table displays the annual average return for the common attribute's best portfolios among the unadjusted sample for 'down' months. The annual average returns for the equally weighted market portfolios (benchmark) are calculated on the bottom row. 'Up months refer to months in which the benchmark delivered a positive return. The portfolio methodology is discussed in Section 8.2. and the attributes derived from the univariate tests of Chapter Six. The parametric ANOVA test tests the null hypothesis that the population means of the monthly returns for the market and attribute portfolio are identical. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Best of the 40 Portfolios	
	Annual Average Return	ANOVA Means Test P value
P	269.41%	0.00
LNCAPS	150.97%	0.00
NTAV_18M	120.24%	0.00
PNAV_12M	168.28%	0.00
NTAV_24M	115.77%	0.00
LNMV	211.47%	0.00
P_12M	166.75%	0.00
VO_3M	117.00%	0.00
MV	208.66%	0.00
TV_3M	78.43%	0.12
PSALES_6M	135.55%	0.00
CASHPS	103.30%	0.01
INTCOVER_BT	65.08%	0.38
PNAV_6M	137.23%	0.00
RI_18M	124.21%	0.00
P_6M	139.17%	0.00
BTMV	98.60%	0.02
Equal weighted market portfolio	55.26%	

E.11. Correlations between Attributes and Attribute Loadings

The table displays the correlations between the attributes and high minus low (HML) attribute loadings. The attribute loadings or coefficients are calculated by regressing all monthly stock returns on the long short portfolio returns. This gives rise to a time series of monthly coefficients. Pearson's Product Moment correlation test is carried out using these coefficients and the attributes. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Correlation between Attribute and Factor Loading															
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
P	-0.31	-0.34	-0.36	-0.36	-0.30	-0.26	-0.26	-0.20	-0.18	-0.18	-0.20	-0.23	-0.25	-0.26	-0.26	-0.26
LNCAPS	-0.38	-0.43	-0.46	-0.48	-0.49	-0.47	-0.47	-0.47	-0.46	-0.46	-0.47	-0.48	-0.48	-0.49	-0.50	-0.51
NTAV_18M	NA	-0.09	-0.05	-0.05	-0.06	-0.06	-0.05	-0.06	-0.06	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
PNAV_12M	NA	-0.30	-0.32	-0.29	-0.29	-0.23	-0.18	-0.17	-0.17	-0.17	-0.15	-0.15	-0.12	-0.08	-0.07	-0.06
EPS	-0.41	-0.48	-0.42	-0.36	-0.36	-0.35	-0.34	-0.32	-0.27	-0.25	-0.25	-0.24	-0.23	-0.23	-0.23	-0.23
POUT	-0.31	-0.31	-0.34	-0.37	-0.38	-0.39	-0.40	-0.41	-0.41	-0.43	-0.43	-0.43	-0.43	-0.42	-0.42	-0.42
NTAV_24M	NA	NA	-0.07	-0.10	-0.12	-0.11	-0.10	-0.11	-0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LNMV	-0.44	-0.46	-0.51	-0.54	-0.51	-0.49	-0.50	-0.49	-0.49	-0.49	-0.50	-0.49	-0.49	-0.49	-0.48	-0.46
P_12M	NA	-0.15	-0.10	-0.05	-0.06	-0.06	-0.06	-0.09	-0.10	-0.11	-0.11	-0.13	-0.12	-0.11	-0.10	-0.10
VO_3M	0.02	-0.08	-0.11	-0.08	-0.07	-0.04	-0.03	-0.03	-0.03	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
MV	-0.23	-0.19	-0.21	-0.22	-0.21	-0.22	-0.23	-0.23	-0.23	-0.23	-0.23	-0.21	-0.22	-0.24	-0.24	-0.24
TV_3M	-0.14	-0.05	-0.07	-0.07	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.01	-0.01	-0.01	-0.01	-0.01
PNAV_18M	NA	0.06	0.00	-0.01	-0.03	-0.02	-0.01	-0.01	-0.02	-0.04	-0.05	-0.04	-0.03	-0.02	-0.02	-0.01
PSALES_6M	-0.15	-0.10	-0.07	-0.07	-0.13	-0.08	-0.06	-0.07	-0.09	-0.08	-0.07	-0.08	-0.07	-0.06	-0.04	-0.04
CASHPS	-0.22	-0.25	-0.26	-0.27	-0.29	-0.27	-0.28	-0.18	-0.18	-0.16	-0.15	-0.15	-0.15	-0.13	-0.13	-0.13
INTCOVER_BT	-0.10	-0.12	-0.13	-0.14	-0.11	-0.09	-0.02	-0.03	-0.01	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03
PSALES_3M	-0.14	-0.09	-0.10	-0.05	-0.09	-0.04	-0.03	-0.04	-0.06	-0.06	-0.06	-0.07	-0.06	-0.04	-0.04	-0.04
PNAV_6M	-0.41	-0.22	-0.14	-0.14	-0.18	-0.12	-0.08	-0.10	-0.11	-0.10	-0.07	-0.09	-0.07	-0.03	-0.03	-0.03
BTMV_18M	NA	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LCPS	-0.08	-0.10	-0.16	-0.18	-0.20	-0.21	-0.21	-0.22	-0.22	-0.22	-0.22	-0.22	-0.23	-0.23	-0.23	-0.24
DEBTNTAV	-0.23	-0.24	-0.28	-0.21	-0.24	-0.26	-0.27	-0.27	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
TV_1M	-0.19	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
PNTAV	-0.25	-0.26	-0.19	-0.18	-0.17	-0.14	-0.16	-0.19	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01
RI_18M	NA	-0.17	-0.20	-0.07	-0.05	-0.03	-0.01	-0.05	-0.08	-0.09	-0.10	-0.12	-0.11	-0.09	-0.09	-0.09
TLCTA	-0.36	-0.39	-0.42	-0.43	-0.39	-0.38	-0.38	-0.37	-0.35	-0.33	-0.32	-0.30	-0.30	-0.28	-0.28	-0.27
EPS_3M	0.04	0.03	0.02	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
NPBT_18M	NA	-0.02	-0.04	-0.03	-0.02	-0.02	-0.03	-0.03	-0.05	-0.04	0.00	0.00	0.00	0.00	0.00	0.00
PTCA	-0.32	-0.40	-0.39	-0.41	-0.43	-0.41	-0.40	-0.43	-0.43	-0.41	-0.37	-0.33	-0.27	-0.21	-0.22	-0.22
P_6M	0.24	-0.11	-0.08	-0.03	-0.06	-0.04	-0.04	-0.07	-0.08	-0.08	-0.07	-0.10	-0.08	-0.07	-0.07	-0.06
BTMV	-0.18	-0.26	-0.13	-0.11	-0.11	-0.12	-0.14	-0.16	-0.17	-0.18	-0.19	-0.21	-0.15	-0.12	-0.10	-0.10
CFOPS	NA	-0.50	-0.38	-0.33	-0.31	-0.26	-0.18	-0.11	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14
DPS_12M	NA	-0.21	-0.18	-0.14	-0.15	-0.16	-0.16	-0.15	-0.14	-0.15	-0.15	-0.15	-0.15	-0.14	-0.13	-0.11
BORROW_RATIO	-0.27	-0.26	-0.31	-0.29	-0.30	-0.31	-0.31	-0.29	-0.30	-0.30	-0.29	-0.28	-0.23	-0.24	-0.24	-0.25
DPS_18M	NA	-0.03	-0.12	-0.12	-0.11	-0.12	-0.11	-0.11	-0.12	-0.13	-0.13	-0.13	-0.14	-0.13	-0.12	-0.10
STCL	-0.33	-0.33	-0.30	-0.30	-0.26	-0.25	-0.23	-0.22	-0.22	-0.20	-0.21	-0.22	-0.24	-0.25	-0.26	-0.26
BOR_REPAY_24M	NA	NA	-0.07	-0.07	-0.05	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03	-0.02	-0.01
TDTTA	-0.27	-0.30	-0.35	-0.36	-0.34	-0.34	-0.34	-0.32	-0.31	-0.30	-0.28	-0.27	-0.27	-0.27	-0.27	-0.27
STTD	-0.22	-0.14	-0.15	-0.17	-0.12	-0.12	-0.12	-0.13	-0.14	-0.14	-0.15	-0.16	-0.09	-0.09	-0.09	-0.09
TV	-0.27	-0.25	-0.21	-0.28	-0.29	-0.29	-0.30	-0.30	-0.28	-0.28	-0.29	-0.30	-0.30	-0.29	-0.23	-0.23

E.12. Correlations between Attributes and Attribute Loadings

The table displays the correlations between the attributes and high minus low (HML) attribute loadings. The attribute loadings or coefficients are calculated by regressing all monthly stock returns on the long short quintile portfolio returns. This gives rise to a time series of monthly coefficients. Pearson's Product Moment correlation test is carried out using these coefficients and the attributes. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Correlation between Attribute and Factor Loading															
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
P	-0.18	-0.26	-0.28	-0.28	-0.26	-0.22	-0.20	-0.16	-0.15	-0.17	-0.19	-0.22	-0.24	-0.25	-0.25	-0.25
LNCAPS	-0.39	-0.43	-0.44	-0.45	-0.46	-0.45	-0.44	-0.40	-0.38	-0.38	-0.39	-0.40	-0.40	-0.42	-0.43	-0.44
NTAV_18M	NA	-0.16	-0.13	-0.16	-0.12	-0.12	-0.10	-0.10	-0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PNAV_12M	NA	-0.18	-0.19	-0.22	-0.19	-0.15	-0.13	-0.12	-0.12	-0.15	-0.13	-0.13	-0.09	-0.06	-0.05	-0.05
EPS	-0.31	-0.40	-0.36	-0.28	-0.27	-0.27	-0.26	-0.24	-0.21	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
POUT	NA	-0.10	-0.13	-0.16	-0.16	-0.17	-0.11	-0.14	-0.17	-0.20	-0.23	-0.25	-0.26	-0.26	-0.27	-0.28
NTAV_24M	NA	NA	-0.14	-0.15	-0.16	-0.14	-0.11	-0.12	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LNMV	-0.37	-0.42	-0.46	-0.48	-0.48	-0.47	-0.46	-0.45	-0.44	-0.45	-0.45	-0.45	-0.45	-0.45	-0.44	-0.43
P_12M	NA	-0.04	-0.02	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.04	-0.04	-0.06	-0.05	-0.04	-0.04	-0.04
VO_3M	0.24	-0.02	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04	-0.03	-0.01	-0.01	-0.01	-0.01	-0.01
MV	-0.14	-0.12	-0.13	-0.15	-0.15	-0.16	-0.17	-0.18	-0.18	-0.19	-0.19	-0.18	-0.19	-0.20	-0.20	-0.21
TV_3M	0.05	0.04	-0.01	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	0.00	0.00	0.00	0.00	0.00
PNAV_18M	NA	-0.12	-0.05	-0.07	-0.10	-0.09	-0.07	-0.07	-0.05	-0.07	-0.08	-0.07	-0.06	-0.04	-0.04	-0.04
PSALES_6M	-0.22	0.00	0.01	-0.07	-0.05	-0.02	-0.01	0.00	0.00	-0.02	-0.02	-0.04	-0.04	-0.03	-0.01	-0.01
CASHPS	-0.23	-0.22	-0.23	-0.24	-0.24	-0.20	-0.19	-0.16	-0.16	-0.15	-0.15	-0.14	-0.14	-0.12	-0.13	-0.13
INTCOVER_BT	-0.15	-0.16	-0.18	-0.20	-0.17	-0.10	-0.06	-0.06	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01
PSALES_3M	-0.04	-0.07	-0.19	-0.13	-0.11	-0.06	-0.04	-0.04	-0.06	-0.05	-0.04	-0.06	-0.05	-0.05	-0.04	-0.04
PNAV_6M	-0.27	-0.13	-0.09	-0.09	-0.14	-0.08	-0.04	-0.04	-0.05	-0.06	-0.03	-0.07	-0.05	-0.01	-0.01	-0.02
BTMV_18M	NA	-0.06	-0.02	-0.02	-0.03	-0.03	-0.02	-0.03	-0.02	-0.03	-0.03	-0.03	0.01	0.01	0.01	0.01
LCPS	-0.13	-0.15	-0.20	-0.23	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.24	-0.24	-0.23	-0.23	-0.23	-0.23
DEBTNTAV	-0.29	-0.27	-0.32	-0.33	-0.34	-0.35	-0.34	-0.34	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
TV_1M	-0.21	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PNTAV	-0.09	-0.11	-0.08	-0.09	-0.09	-0.09	-0.10	-0.13	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
RI_18M	NA	0.08	0.03	0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
TLCTA	-0.28	-0.29	-0.32	-0.31	-0.30	-0.28	-0.28	-0.27	-0.27	-0.26	-0.25	-0.24	-0.24	-0.24	-0.24	-0.24
EPS_3M	-0.02	0.04	0.04	0.04	0.04	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.00	0.00	0.00	0.00
NPBT_18M	NA	-0.10	-0.12	-0.10	-0.08	-0.09	-0.10	-0.10	-0.10	-0.06	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
PTCA	-0.32	-0.37	-0.37	-0.37	-0.35	-0.34	-0.34	-0.35	-0.35	-0.35	-0.32	-0.30	-0.24	-0.19	-0.20	-0.20
P_6M	0.06	0.04	0.05	0.04	0.03	0.03	0.03	-0.02	-0.03	-0.04	-0.02	-0.06	-0.05	-0.03	-0.03	-0.03
BTMV	0.10	0.01	-0.06	-0.07	-0.06	-0.07	-0.10	-0.11	-0.11	-0.13	-0.17	-0.19	-0.12	-0.10	-0.09	-0.09
CFOPS	NA	-0.28	-0.19	-0.14	-0.16	-0.18	-0.18	-0.19	-0.18	-0.17	-0.18	-0.19	-0.19	-0.19	-0.19	-0.19
DPS_12M	NA	-0.19	-0.14	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.12	-0.12	-0.11	-0.11	-0.10	-0.10	-0.08
BORROW_RATIO	-0.22	-0.19	-0.23	-0.19	-0.21	-0.24	-0.25	-0.26	-0.27	-0.26	-0.26	-0.24	-0.20	-0.20	-0.20	-0.21
DPS_18M	NA	-0.08	-0.07	-0.06	-0.06	-0.06	-0.04	-0.05	-0.05	-0.07	-0.08	-0.08	-0.09	-0.08	-0.07	-0.04
STCL	-0.29	-0.31	-0.29	-0.23	-0.22	-0.21	-0.19	-0.19	-0.20	-0.19	-0.19	-0.21	-0.22	-0.24	-0.25	-0.25
BOR_REPAY_24M	NA	NA	-0.10	-0.09	-0.08	-0.07	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
TDTTA	-0.25	-0.27	-0.28	-0.19	-0.20	-0.22	-0.23	-0.23	-0.24	-0.24	-0.23	-0.22	-0.23	-0.24	-0.24	-0.25
STTD	-0.30	-0.26	-0.26	-0.25	-0.17	-0.15	-0.15	-0.14	-0.14	-0.14	-0.14	-0.15	-0.09	-0.08	-0.08	-0.08
TV	-0.21	-0.24	-0.15	-0.16	-0.23	-0.24	-0.23	-0.23	-0.21	-0.21	-0.23	-0.25	-0.26	-0.26	-0.20	-0.21

E.13. One way sorts for Attributes and Attribute Loadings for '20 portfolios'

The table displays the average returns for the highest, lowest and highest minus lowest (HML) portfolios for one way '20 portfolios' sorts conducted on both attributes and attribute loadings. The t-statistics under the highest minus lowest portfolio relate to the test of whether the time series of returns of the lowest and the highest portfolios are different. The leftmost t-statistic refers to the HML loading returns while the rightmost refers to those of the attribute. The long short portfolio consists of the highest '20 portfolios' returns less the lowest one. The share returns are sorted monthly according to the attribute and its loading and two portfolios are created containing the highest and lowest returns quintiles of the monthly data. The t-statistics that are significant at their 5% level are in bold. The data were extracted from DataStream International, available at the University of Cape Town. Refer to Table 4.1 in Chapter Four for the definitions of the firm-specific attributes.

Attribute	Highest Quintile Returns		Lowest Quintile Returns		[Highest - Lowest Quintile] Returns			
	HML Loading	Attribute	HML Loading	Attribute	HML Loading	t-statistic	Attribute	t-statistic
P	2.90%	0.18%	1.54%	5.20%	1.36%	1.80	-5.02%	**5.24**
LNCAPS	2.52%	0.25%	1.57%	4.45%	0.95%	1.28	-4.20%	**5.06**
NTAV_18M	2.61%	3.69%	1.88%	-0.42%	0.73%	0.97	4.11%	**4.66**
PNAV_12M	1.48%	4.58%	2.55%	0.11%	-1.07%	1.53	4.47%	**4.41**
EPS	2.22%	0.84%	1.76%	2.05%	0.45%	0.65	-1.21%	1.80
POUT	1.90%	0.41%	1.90%	1.34%	0.00%	0.00	-0.93%	0.90
NTAV_24M	2.47%	3.39%	2.36%	0.40%	0.11%	0.14	2.99%	**3.36**
LNMV	2.79%	0.94%	1.50%	4.79%	1.28%	1.75	-3.85%	**4.24**
P_12M	2.37%	4.68%	1.70%	1.64%	0.67%	0.93	3.04%	**2.73**
VO_3M	1.96%	3.90%	2.28%	1.70%	-0.32%	0.48	2.20%	**2.85**
MV	2.75%	0.94%	1.54%	4.83%	1.21%	1.66	-3.89%	**4.31**
TV_3M	2.22%	3.04%	2.15%	1.69%	0.07%	0.11	1.35%	**1.98**
PNAV_18M	2.35%	3.69%	1.88%	0.90%	0.47%	0.64	2.79%	**2.71**
PSALES_6M	1.94%	3.67%	2.02%	0.51%	-0.07%	0.11	3.15%	**3.32**
CASHPS	2.60%	0.41%	1.48%	3.30%	1.12%	1.52	-2.89%	**4.16**
INTCOVER_BT	2.40%	2.25%	1.70%	0.01%	0.70%	0.95	2.24%	**2.62**
PSALES_3M	1.69%	3.16%	2.22%	1.30%	-0.53%	0.78	1.86%	**2.06**
PNAV_6M	2.02%	3.74%	1.93%	0.57%	0.08%	0.12	3.18%	**3.30**
BTMV_18M	1.94%	3.53%	2.38%	1.42%	-0.44%	0.60	2.11%	**2.04**
LCPS	2.08%	0.97%	1.56%	3.10%	0.52%	0.73	-2.13%	**2.79**
DEBTNTAV	2.17%	1.11%	1.61%	1.11%	0.56%	0.76	0.01%	0.01
TV_1M	1.58%	2.09%	2.51%	1.39%	-0.93%	1.35	0.70%	1.09
PNTAV	2.04%	0.91%	1.89%	2.94%	0.15%	0.19	-2.03%	**2.65**
RI_18M	2.77%	3.26%	1.87%	2.97%	0.90%	1.20	0.29%	0.26
TLCTA	2.11%	1.50%	1.86%	1.65%	0.25%	0.36	-0.15%	0.20
EPS_3M	2.08%	2.10%	1.94%	0.51%	0.14%	0.20	1.59%	**2.45**
NPBT_18M	2.08%	1.91%	2.20%	1.03%	-0.12%	0.16	0.88%	1.08
PTCA	1.80%	2.58%	2.02%	1.15%	-0.22%	0.29	1.43%	1.71
P_6M	2.37%	3.80%	1.64%	2.77%	0.73%	1.02	1.04%	0.93
BTMV	1.79%	3.75%	2.51%	0.60%	-0.72%	0.94	3.15%	**3.86**
CFOPS	1.92%	0.57%	1.57%	-0.18%	0.35%	0.41	0.75%	0.86
DPS_12M	2.52%	1.83%	1.54%	0.76%	0.98%	1.30	1.07%	1.57
BORROW_RATI	2.22%	1.18%	1.72%	1.88%	0.50%	0.72	-0.70%	0.87
DPS_18M	2.29%	1.25%	2.11%	0.42%	0.18%	0.24	0.83%	1.19
STCL	1.91%	1.57%	1.81%	2.11%	0.10%	0.15	-0.53%	0.68
BOR_REPAY_24	2.18%	1.21%	2.63%	1.03%	-0.46%	0.62	0.18%	0.26
TDTTA	2.07%	1.61%	1.77%	1.80%	0.30%	0.43	-0.19%	0.26
STTD	1.88%	1.90%	2.28%	1.23%	-0.40%	0.52	0.67%	0.92
TV	2.06%	2.47%	1.75%	1.41%	0.31%	0.43	1.05%	1.48